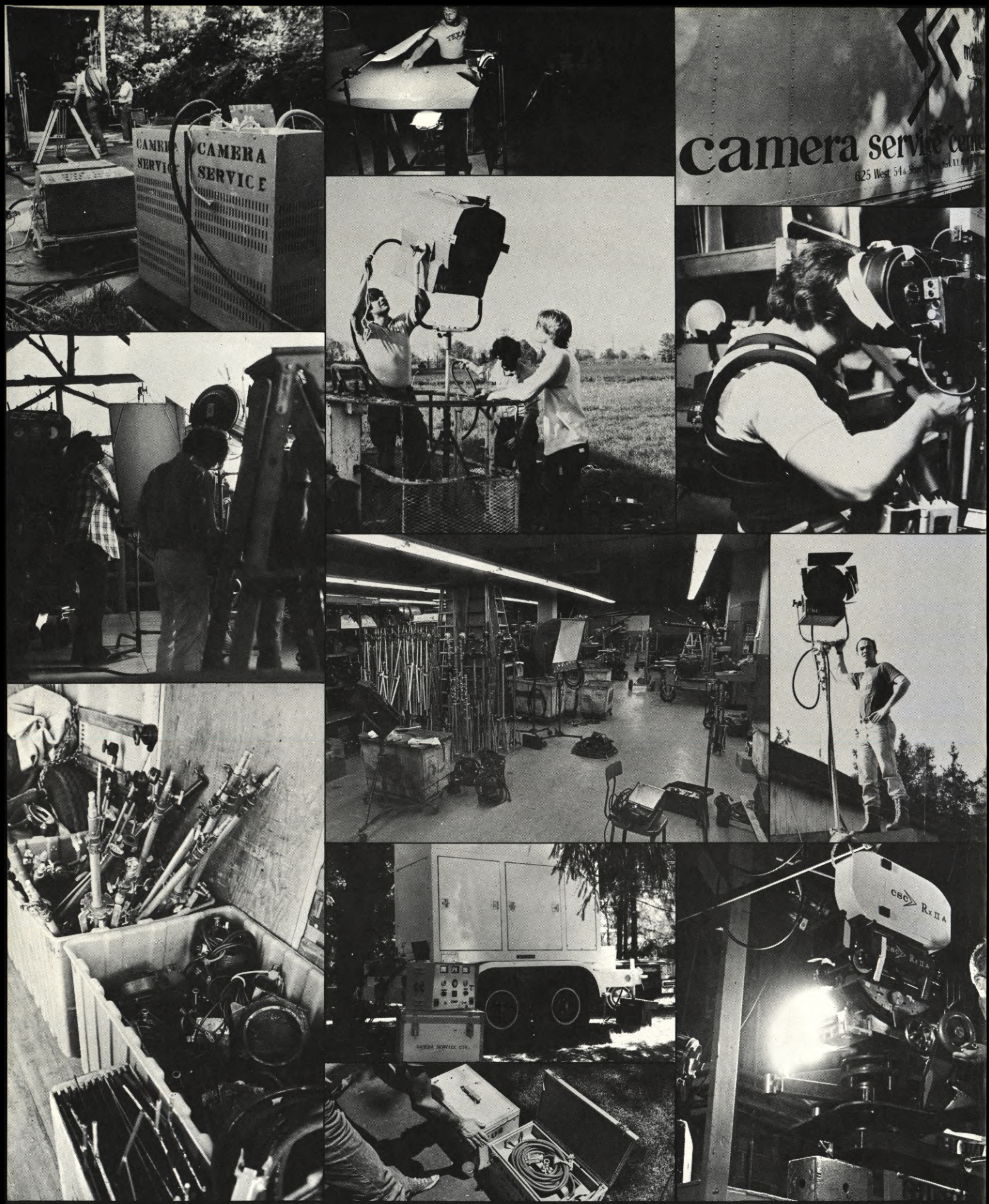
American Cinematographer

International Journal of Motion Picture Photography and Production Techniques

OCTOBER 1978/$1.50

THE FILMING OF "THE DEER HUNTER"



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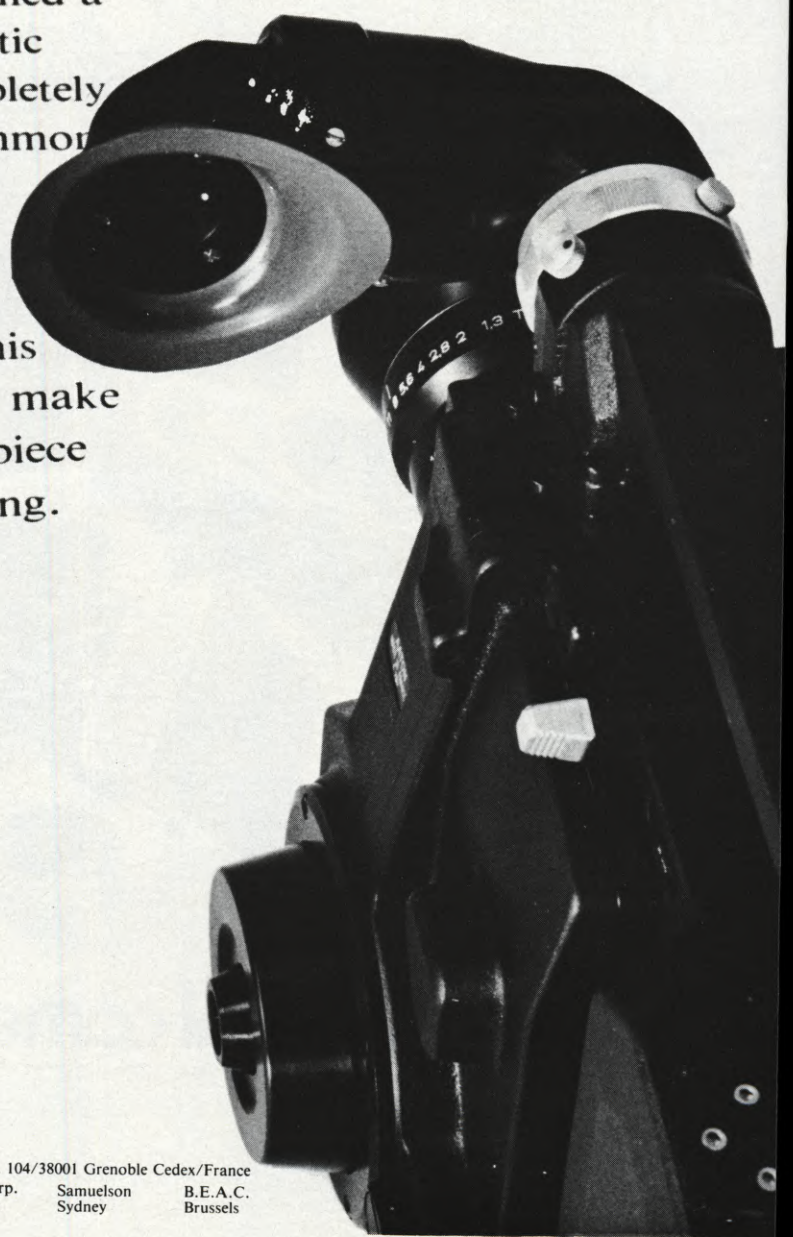

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American Cinematographer

International Journal of Motion Picture Photography and Production Techniques

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ON THE COVER: Film crew shooting an elaborate wedding sequence inside St. Theodosius' Russian Orthodox Cathedral in Cleveland, Ohio, for "THE DEER HUNTER", an EMI Films production for Universal Pictures release in the United States and Canada, and in the rest of the world by EMI Film Distributors, Ltd. The film, starring Robert De Niro, was written and directed by Michael Cimino and photographed by Academy Award-winning cinematographer Vilmos Zsigmond, ASC.

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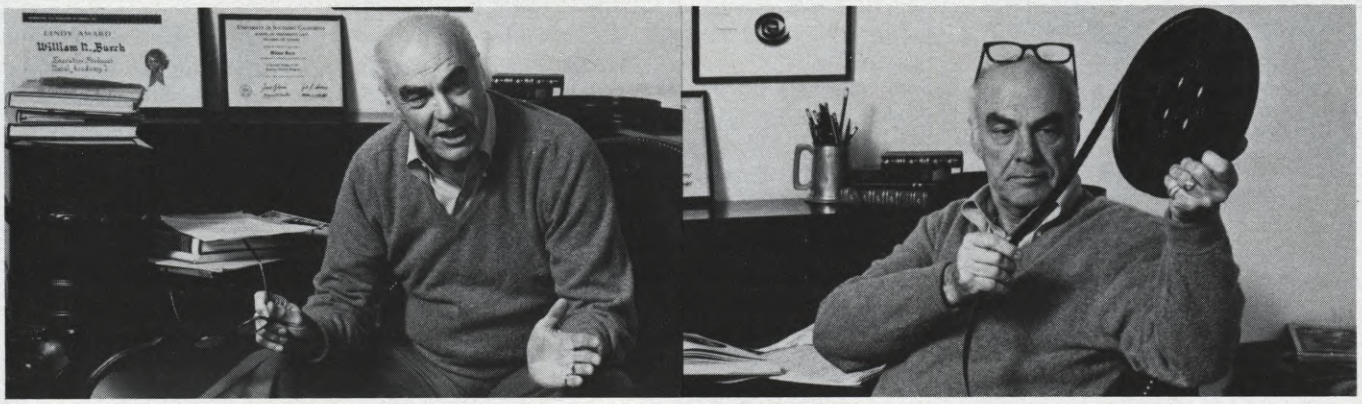

"I sell ideas..."

The same people who kept you on the edge of your seat with "Jaws," "Airport," and "The Sting" have now created a similar sensation with a dramatic story from the middle of the North Sea. This is happening because William N. Burch, president of the Universal Commercial Industrial Films Division of MCA, believes that the term "industrial" filmmaking is no longer an adequate description of his work.

Concepts on Film

" 'Industrial' films can now be termed 'informational,' " insists Bill, a respected pioneer in the world of corporate image films. Leading Fortune 500 companies such as IBM, General Motors, Ford, Phillips, Coca-Cola, Sears, Bethlehem Steel, Eli Lilly, RCA, etc., often present their corporate ideas and ideals to Bill requesting him to create concepts that train, recruit, or simply impart knowledge. "I don't necessarily sell film; I sell ideas," Bill explains. With these award-winning ideas, Bill has achieved an enviable standard in the industrial filmmaking marketplace.

Action Imagery

"U.S. Art, A Gift of Ourselves," produced for Sears Roebuck Foundation, received international acclaim for its innovative use of kinestasis animation. This engaging film traced a full 200 years of fine arts development in American music, sculpture, painting, movies, television, etc. Nineteen thousand arts-oriented images were compressed into a mere half-hour film that explodes visually on the screen. Another exciting UCIF production, "Ekofisk, City at Sea," challenged an entire crew to tolerate the inherent dangers of filming in the middle of the North Sea in order to capture on film and communicate the harsh realities of oceanic oil exploration.

Tape or Film

"Once the idea is sold, the customer tells us whether he wants the job on film or on tape. Usually, the client will go to film because there is a far wider acceptance of film...personally, I prefer film.

"Tape is great for some shoots, however, taking a mobile unit out and expecting it to work immediately just doesn't happen that often. Film gives us a choice of shots and the opportunity to look and look again in post-production at the effectiveness of a particular scene.

"It all begins for us on Eastman color negative II film 7247...regardless of how it ends up: ½-inch, ¾-inch, 1-inch or 2-inch tape; 8 mm, 16 mm, 35 mm, videodisc... We're fully confident we're going to get a beautiful image out of it. It takes so much of the gamble out of filmmaking.

Opportunities

"Cinema students are always anxious for suggestions on how to break into the Hollywood marketplace. A glimpse at Bruce Green's work, a USC cinema school graduate and now UCIF's multitalented director, demonstrates the tremendous potential and satisfaction that can be derived from excelling in this informational filmmaking area. Whether this challenge is accepted from a production company or from a corporation with in-house capability, there are numerous opportunities that will help launch a promising career for any willing student.

"Films that truly motivate have become a necessity rather than a luxury," says Bill Burch. "To repeatedly achieve the client's objective and to continually work toward greater creative heights gives me a unique personal satisfaction. Anyone who scales these cliffs in the industrial or informational filmmaking field is bound to appreciate the climb."

Kodak Professional Forum, our newest filmmaking publication, offers additional insight into current activities, trends and people involved in motion picture production. If you wish to be added to our Forum mailing list, write us: Eastman Kodak Company, Dept. 640, 343 State Street, Rochester, N. Y. 14650.

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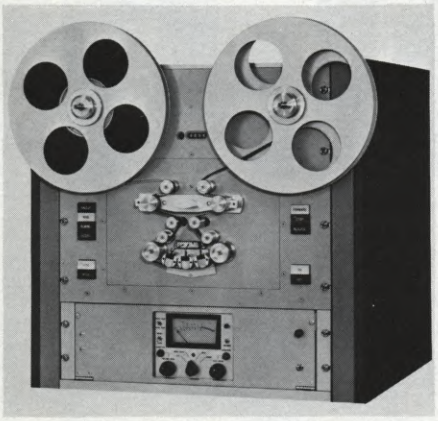
Kodak...Official photographic consultant to the 1980 Olympic Winter Games.

WHAT'S NEW

IN PRODUCTS, SERVICES AND LITERATURE



LOW-COST MAGNETIC FILM RECORDERS/REPRODUCERS

Wide Range Electronics Corporation has recently introduced a new series of magnetic film recorders and reproducers that satisfies the motion picture industry's demands for high performance film handling characteristics *and* for limited budgets.

The 3600 series is available for 16mm and 35mm film formats: as single-track and multi-track units; and as recorders, pick-up recorders, and dubbers. These units combine the finest in transport design for superb film handling and solid state electronics in a modular approach for the customer's own rack-mounting. All models meet or exceed the SMPTE recommended standards for 16mm and 35mm recorded sound. Included in the many options available are vertical mount reels for 3000 foot film capacity, 19-inch cabinets, and various motor drive systems. Prices start at $2,465.00. Delivery is 60 days.

WRE designs and manufactures a complete line of magnetic and optical sound recording systems including High-Speed Super-8 Transfer Systems, Dual Dubbers, the F-Prime Galvanometer, Digital Footage Counters, Bulk Degaussers and other system accessories.

For further information, contact: Wide Range Electronics Corp., 2119 Schuetz Road, St. Louis, MO. 63141. Telephone (314) 567-5366.

•

NEW 4KW SOFTLITE INTRODUCED BY BERKEY COLORTRAN

A new light-weight, compact 4000 watt Softlite has been introduced by Berkey Colortran, Inc., Division of Berkey Photo, Inc. Dubbed the 1kW/4kW Softlite, the unit represents a new advance in high output, professional lighting equipment design, according to Peter T. Coe, Berkey Colortran President.

The Softlite is designed for use as a fill light in motion picture, still photographic, and television studio applications. Manufactured of light weight aluminum, the unit is designed for use with 4-1000 watt FCM lamps. Each lamp is individually switched so that the unit may be energized in 1000 watt increments up to its full rated capacity.

An 800 watt, 240 volt lamp is available for overseas applications.

The unit provides a lighting intensity of 200 foot candles at 15 feet from the unit with a beam diameter of 16 feet.

The unit is equipped with 36", 3 wire leads and is available in a variety of power input versions.

The unit is 10" deep, 24" wide and 22" high and weighs 19.25 lbs. The unit lists for $425.00, F.O.B. Burbank, California.

Berkey Colortran is a major manufacturer of lighting equipment and control systems for theatrical, television, motion picture and still photographic applications. Complete technical literature is available from Berkey Colortran, Inc., 1015 Chestnut Street, Burbank, California 91502; telephone (213) 843-1200.

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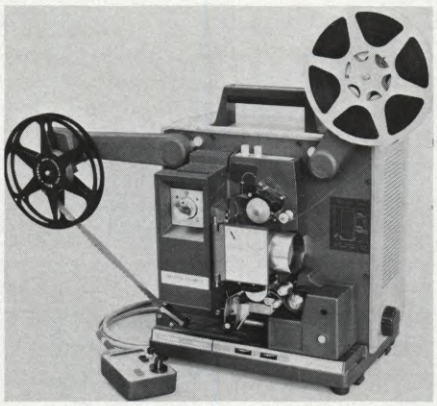

NEW 16mm FLICKERLESS PROJECTOR

Visual Instrumentation Corporation has introduced the unique new Selecta-Frame 5 16MM Analysis Projector available in both sound and silent models. Features include completely flickerless projection, stop-action, single frame, slow motion, variable speeds forward and reverse, and high brightness lamp/lens system.

A control box provides local or remote operation up to 25 feet from the projector. It has been human factor designed for easy one-hand operation of all control functions. The box also incorporates a 5-digit LED frame count display with zero reset.

The Selecta-Frame 5 operates at 16 and 24 fps cine plus 8 discrete pulse rates from one pulse every 4 seconds to one pulse every 2 seconds, 1-2-4-6-8 and 12 pulses per second. Other features include all solid state digital control logic, 2000' film capacity and fast power rewind. The Selecta-Frame 5 incorporates the same basic movement and electronics of its predessor, Model IV, which has established a high record of reliability over the past several years.

For further information contact Fred Rodgers, Vice President, Visual Instrumentation Corporation, 903 N. Victory Boulevard, Burbank, CA 91502 (213) 843-5311.

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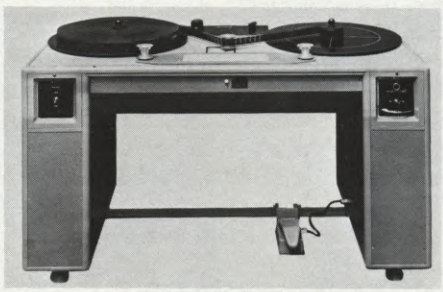


NEW AUTOMATIC FILM REWIND TABLES

An improved version of their high-speed automatic rewind table has been introduced by Acmade International, the leading British film equipment manufacturer.

This new table caters for rolls of film or tape up to 3,000 ft and rewinds at a rate of 1,000 ft per minute. Both 35mm and 16mm are catered for. The machine is started by pushbutton, and at the end of the rewind, automatic braking is applied, so that the operator's time is not tied up during winding.

An illuminated panel is provided to enable the film to be inspected and a foot control pedal allows the speed to be infinitely varied.

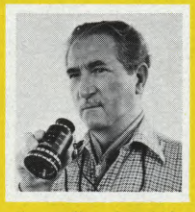
Improved electrical circuitry has been developed to ensure reliability, as well as a much smoother transport of the film compared with earlier models.

Further information available from: T.J. Bryars; Sales Manager; Acmade International; Oakside; Oxford Road; Uxbridge; Middlesex, England. Tel: Uxbridge 36313. ■

introducing the Mark IV

director's viewfinder

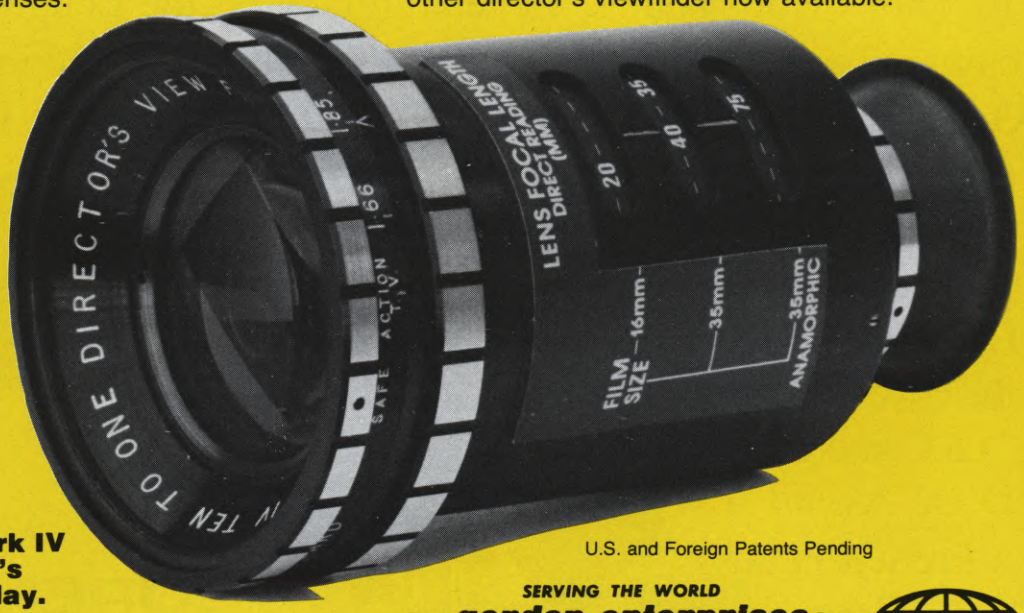
with 10:1 zoom



The all-new Mark IV 10:1 Zoom Director's Viewfinder is an indispensable tool for the director or cameraman in composing scenes and choosing the appropriate lenses. It is the first and only viewfinder to offer a zoom ratio of 10:1 for both 35mm and 16mm film formats, making it compatible with most standard professional zoom lenses. It is a practical, easy-to-read viewfinder that was designed after many years of research to meet the specific needs of the film director and cameraman working in the 16mm and 35mm motion picture and television fields.

Among the exclusive features of the new Mark IV 10:1 Zoom Director's Viewfinder are:

- Easy-viewing, direct-reading scales calibrated in lens focal lengths. No numbers to compute.
- Optical-quality coated glass lenses.
- Lightweight, sturdy, precise construction. Weighs only 13 ounces.
- Focusing eyepiece with collapsible rubber eye cup.
- Smooth zoom movement patterned after camera zoom lenses.
- Click-stop aspect ratio controls for selecting formats of 1.33, TV Safe Action Area, 1.66, 1.85 and 2.35.
- Three windows on barrel of viewfinder for easy readouts of focal length of specific lens for 16mm and 35mm Academy or 35mm Anamorphic format.
- Image viewed is 50% larger and gives brighter and higher quality image than any other director's viewfinder now available.



U.S. and Foreign Patents Pending

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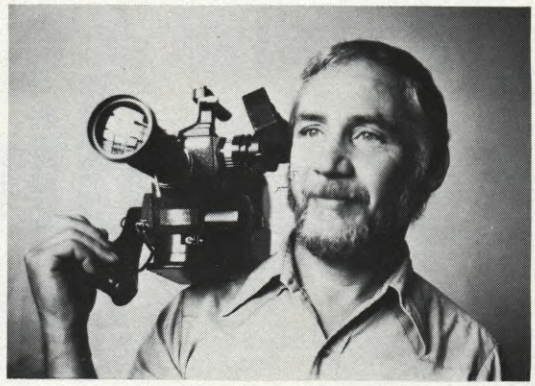
Bob Young and the ECLAIR win big at Cannes!



Cinematographer/Director Bob Young was recently awarded the coveted Cannes Film Festival "La Camera D'Or" Award for his film, "Alambrista." This remarkable film was made through the genius of Bob Young and the versatility of the Eclair NPR (a formidable combination) . . . shooting from the shoulder, the chest, the hip and the knee, while standing, bending, kneeling and running!

Although shot in 16mm, "Alambrista" won the 35mm award. The excellence of blow-up processing to 35mm by Du Art Film Laboratories certainly contributed to the film's big screen success.

To quote Bob Young, "The intimacy of the Eclair cameras gives me the mobility to control the making of a film." Only by viewing Bob Young's amazing work, can you appreciate the full meaning of his words.

The French Eclair ACL

Incidently, the coveted "La Camera D'Or" Award was a French Eclair ACL 16mm camera!

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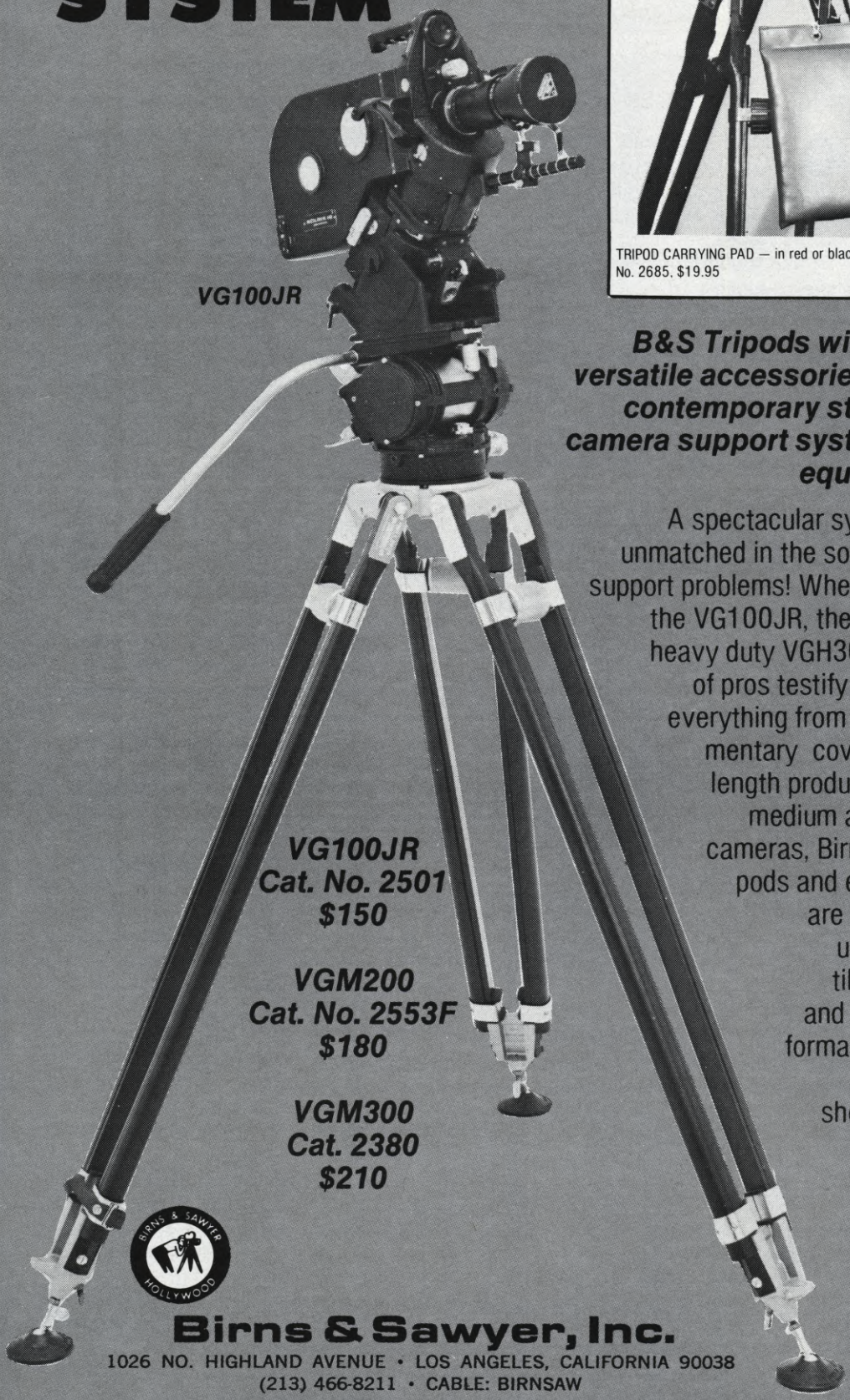

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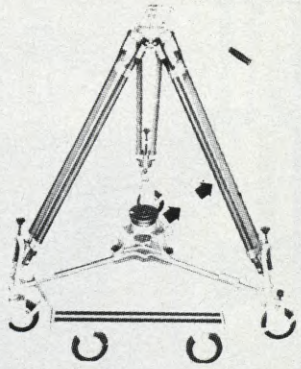

The BIRNS & SAWYER SENIOR DOLLY for studio, industrial and location filming. Has exclusive hi-hat mounting bracket (see inset). Less Hitch-Hiker. Catalog No. 2200, $210. Less Hi-Hat

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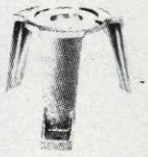

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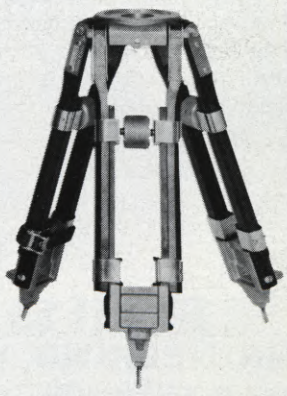

VG100JR BABY, Catalog No. 2502, $150

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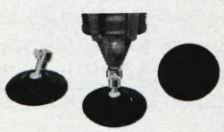
Ball Socket Hi-Hat for Arri 16 and other ball heads, Catalog No. 1123, $50. Ball is extra.



TRI-PED GRIPTIPS, set of 3, $13.95 Catalog No. 2115.

Arri 35 Camera Riser to adapt 35mm cameras to standard pan heads, Catalog No. 1124, $59.95

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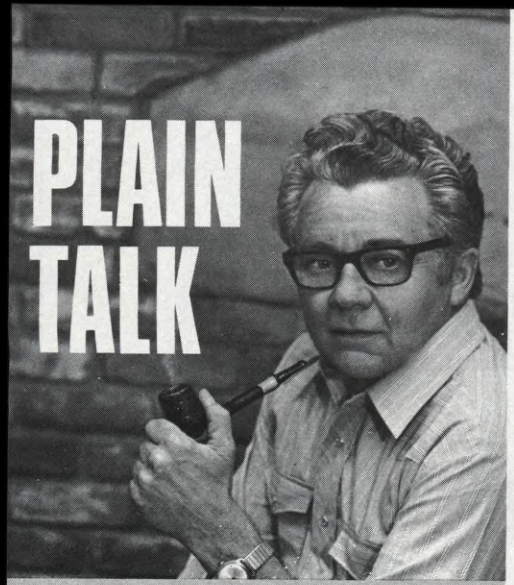

by J. Carl Treise

If a processor has to be modified beyond Kodak specifications, to give you the speed you want, don't buy it.

It's no trick to increase the film speed of a processor. All you have to do is raise the temperature, thus decreasing the development time.

However, when you do this, you're exceeding the specifications provided by Kodak for processing color films.

Maybe you can get away with it for awhile. But sooner or later, something will go wrong and when that happens, you've got no one to blame but yourself.

To put it bluntly, whenever a firm persuades you to buy a modified unit, you're asking for trouble.

How do we know?

We not only build processors, we rebuild them, too. And most of the units we're asked to work on belong to people who "bought a pitch" and then later came to us for advice on how to get out of the jam they found themselves in.

This kind of talk won't stop people who are interested only in price. But it might make a difference to those of you who are willing to spend a few extra bucks for a processor you don't have to "push" to give you the speed you want.

In the long run, you'll save money, as well as a lot of grief.

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QUESTIONS & ANSWERS

Conducted by CHARLES G. CLARKE, ASC.
and WINTON HOCH, ASC.

(Inquiries are invited relating to cinematographic problems. Address: Q. & A., AMERICAN CINEMATOGRAPHER, P.O. Box 2230, Hollywood, Calif. 90028.)

Q I have read with great interest your comments on printer sharpness and would like to suggest that this topic be given more exposure in the future.

I find the improvement in definition overwhelming when comparing any workprint (obtained from either 7252 or 7247) with Kodachrome original.

Are step optical printers better than contact printers? Does printing speed affect resolution? One would believe that high-resolution printing would have been made available at least for the internegative process.

I would appreciate any information you could give me on higher resolution printers (optical?) if available.

A It would take almost a complete textbook to answer your questions in depth. For you to obtain a full understanding of the various factors involved in the characteristics of different types of printing machines, you would have to spend many hours reading all the articles that have appeared in the Journal of the Society of Motion Picture and Television Engineers and its predecessor publications over the past 60 years. We therefore, can only give you a few guidelines in this column in answer to your questions.

It is risky to generalize about different types of printing machines because it is possible for several specimens of the same type of machine to give different results depending upon individual variations in construction and adjustment. Optical printers are too slow to be economically justifiable except when making a master positive or duplicative negative where the correct image orientation is not obtainable by contact printing. Usually this also entails the use of wet gate printing to obliterate the tiny scratches and abrasions that are not visible in contact printing.

Several laboratories have step contact printers which are also not economically justifiable except where it is necessary to have "rock steady" printing to avoid apparent movement between two or more sequential exposures such as titles over motion picture backgrounds or multiple exposure effects. It is safe to assume that 99% of all Motion Picture printing both 35mm and 16mm is performed on continuous printers. If this type of printer is in perfect operating condition, there is no noticeable loss in sharpness as compared to a step printer.

To test the performance of any printing machines, you can compare prints (all of the same density) from an original camera negative made by photographing a test chart such as may be obtained from the Bureau of Standards, the SMPTE, or Modern Photography magazine. The prints should be evaluated by projection and by examination under a microscope.

Q In this area, at least, the new VNF-1 emulsions are pushing aside the older ME-4 films in the amount of time that the local labs are spending in processing these films. However, there is a problem with the prints made from the VNF-1 films; i.e., the camera original may be of excellent quality, but the print will be of a much poorer quality. This seems to be more than just a problem of succeeding generations. Working in a TV station in which we use VNF emulsions and have had a recurring problem of blue film, I have heard many excuses alternately blaming both the film and chemical companies. What is the *real* story?

A The most important reason for poor color quality on reversal prints made from VNF emulsions is the use of the wrong emulsion. Kodak manufactures VNF print film type 7399 which is especially mated to the characteristics of the VNF originals. The first objective in your investigation should be to ascertain that this is the emulsion type being used to manufacture your prints.

If reversal positive type 7399 is indeed being used, then you should make some cross-checks among several laboratories to determine whether the fault lies in the processing of the original film or in the reversal print film, or in both. Improper color correction in printing may also be a factor.

In general, it may be stated that although color processing is more complex than black and white processing, there may be fewer actual troubles in color processing because the manufacturer's formulas and directions must be adhered to with no variation. ■

"Action! Cut!"

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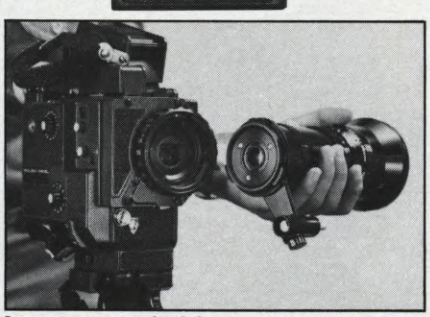

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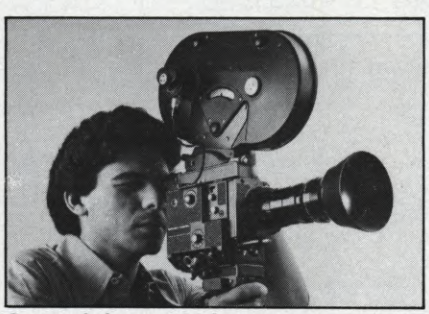

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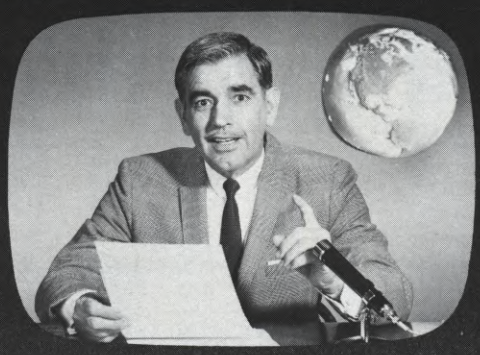

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CINEMA WORKSHOP

By ANTON WILSON

LIGHTING FOR TELEVISION:

There is no doubt that the television industry, directly and indirectly, consumes a major portion of the motion pictures now being produced. In addition, many film directors and cinematographers now find themselves working directly with electronic recording. Alas, I must confess that I too have succumbed to the demand for the electronic product and now shoot in both the classic as well as the *vid-nouveau* media. This heresy does not come without its price, as I am frequently plagued by nightmares wherein I am bound hand and foot with coaxial cables and helically scanned by 525 marauding plumbicons, while having my phase forcibly shifted by a mammoth (and sadistic) time base corrector.

Aside from this, the transition from film to tape should not be difficult for a cinematographer. In general, the elements of composition and camera movement remain similar, although often the small size of the CRT (TV) screen must be considered. The area of lighting, however, seems to pose the greatest transitional hurdle for the cinematographer.

There are two schools of thought on this subject that are, as usual, diametrically opposed. The first believes that lighting for television is no different from lighting for film, and the other, that television lighting requires an entirely different technique. I tend to take an intermediate position, favoring the former. The basic art of film lighting applies equally to television and I am convinced that cinematographers and film Directors of Photography also make the best lighting directors in video productions. They have learned the art of painting with light, as opposed to the practice of illuminating an area to so many foot-candles. There are, however, several factors that must be considered, due to the particular nature of the video process.

Under normal circumstances, the television process has a much smaller luminance or contrast range than film. Most cinematographers are accustomed to a luminance ratio of 64:1 to 128:1 representing 6 to 7 "f" stops. Television, on the other hand, cannot cope with ratios much above 32:1—or about five stops. As a result, lighting ratios seldom exceed 2:1 and care must be taken outdoors to avoid dark shadows caused by direct sunlight. Exteriors usually call for sunlight diffusers, reflectors and often fill light in the way of the newer HMI-type lights. Attention must also be given to background lighting, as the television signal does not pick up shadow detail well, nor does it cope well with large homogeneous dark areas which tend to show noise and recording imperfections, particularly on later generations.

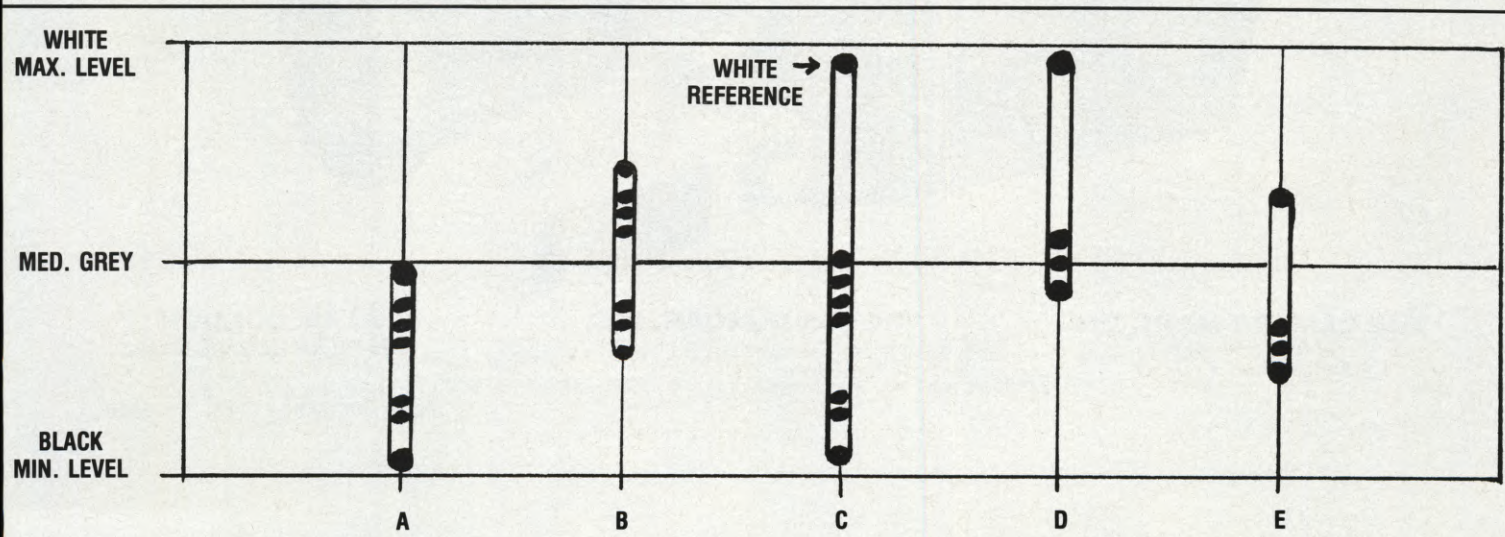
One may draw the erroneous conclusion that lighting for video is synonymous with low contrast or flat lighting. Such is not the case. Ironically, low contrast situations, particularly predominantly light or dark scenes, must also be avoided. Most home TV receivers have poor (to abominable) DC restoration. What this means, is that the TV signal will tend to center itself about a medium gray.

For instance, on a recent documentary called *"The Cocaine Connection"*, I filmed two users injecting cocaine by candlelight in an otherwise unlit room, using fast lenses and high speed film. I

Continued on Page 998

FIGURE 1

A. A dark scene — All elements are medium gray or darker, including black.
B. The scene of Example "A" above, as viewed on a home TV receiver. The scene has "floated" upward, centering itself about a medium gray. The "blacks" of the original scene have become gray and the overall impression is a low-contrast, washed-out foggy image.
C. By adding a "white reference" to scene "A" in the form of highlights or a white light, the entire video signal range is "filled up" and, thus, the image has no room to "float". The scene of Example "C" will be viewed on the home receiver as it appears ("C").
D. Likewise, a scene as in "D" should be avoided because it lacks a black reference.
E. The above scene ("D") will float downward and appear as "E" on a home receiver. The medium gray objects (such as faces) will become almost black.



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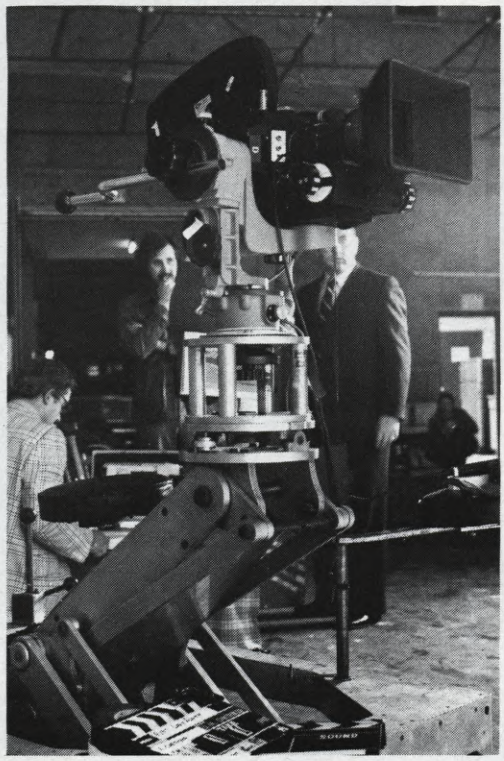

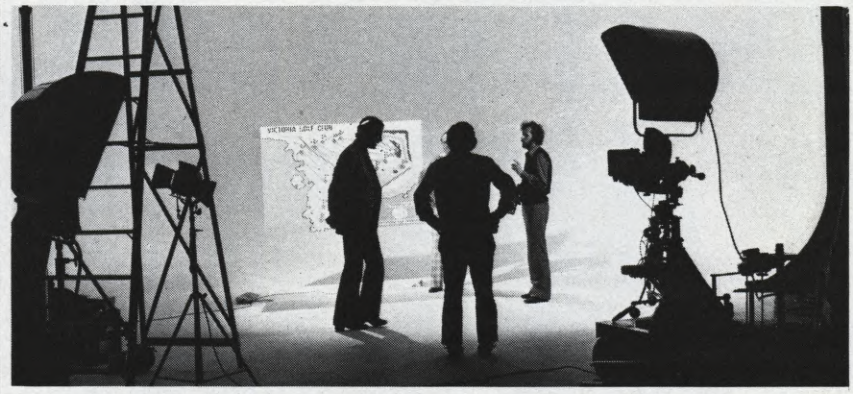

Canadian cinematographer David M. Ostriker (at right) shooting a television commercial with his own CP-16R and Studio Rig.
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The CP-16R with Studio Rig on a soundstage in Vienna, during the filming of a musical comedy feature for television.

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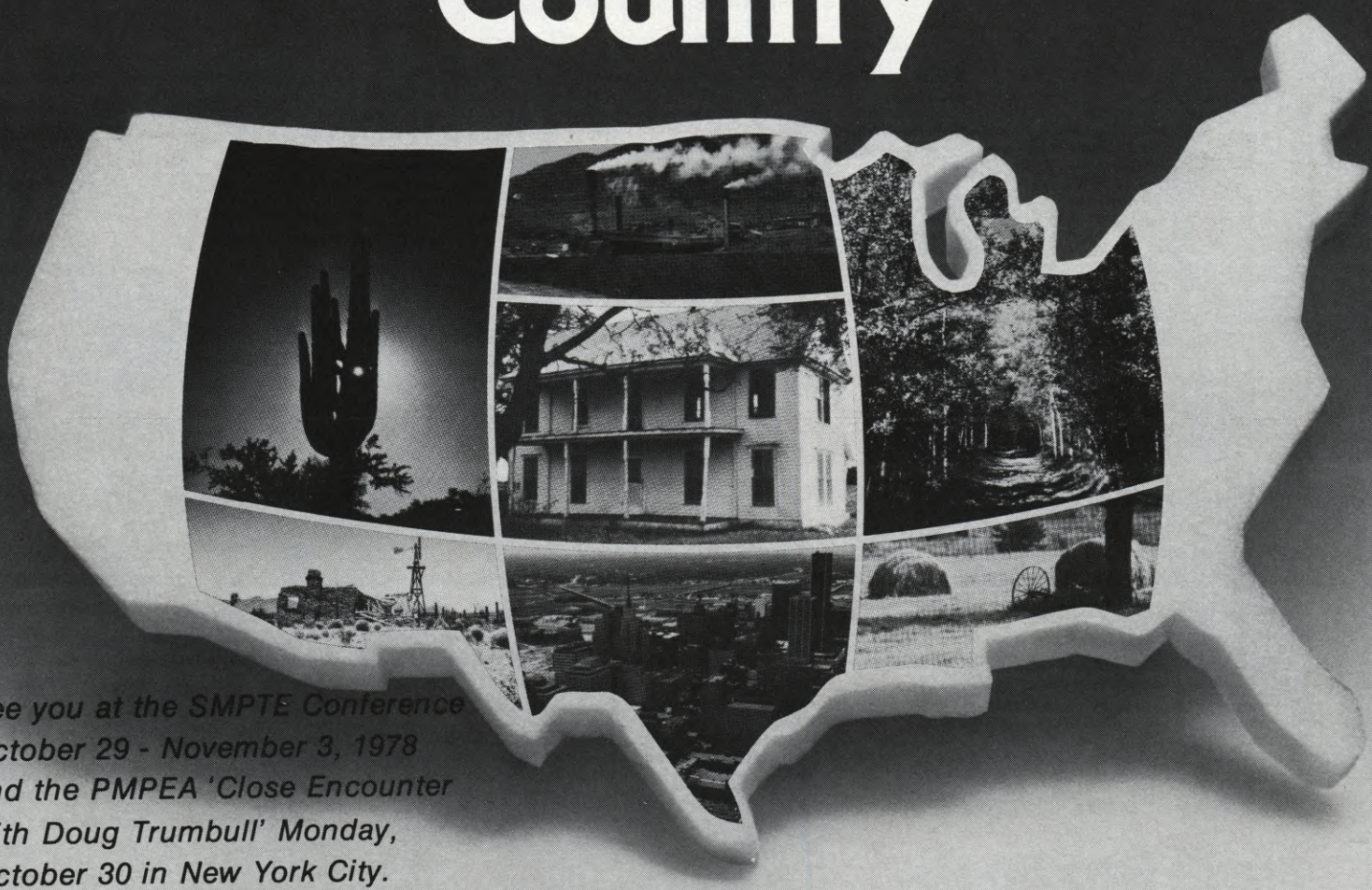

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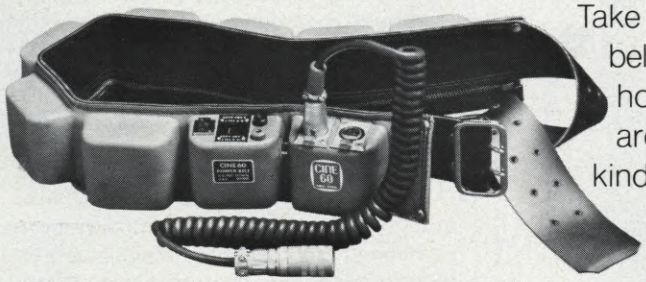

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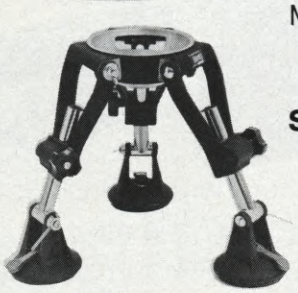

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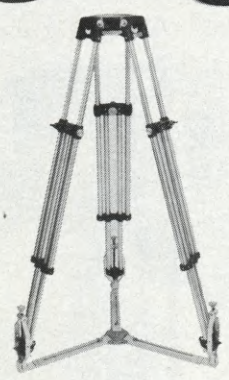

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THE BOOKSHELF

By GEORGE L. GEORGE

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Famous for his acerbic wit, his outspokenness and his drinking and gambling habits, Herman Mankiewicz is fittingly memorialized in MANK by Richard Meryman. Author of the celebrated *Citizen Kane* screenplay, Mankiewicz was a prolific writer whose life was as colorful as one of his inspired movie scripts (Morrow $12.95).

In THE RESTLESS LIFE OF JAMES AGEE, Genevieve Moreau offers a sensitive appraisal of the late novelist and screenwriter (*The African Queen*), whose complex and elusive literary personality she analyzes in the light of his esthetic interests (Morrow $4.95).

Joan Fontaine's autobiography, NO BED OF ROSES, is one of the most sincere and affective of the genre. Deeply emotional and with a self-fulfilling unhappiness, the actress relates her youth problems, her four marriages, and a successful screen career that nonetheless never satisfied her efforts and ambitions (Morrow $9.95).

In ROBERT MITCHUM ON THE SCREEN, Alvin H. Marill aptly reviews the career of the rugged actor in a detailed and well illustrated record of 30 years' acting in 95 movies. A film-by-film survey follows an extensive assessment of Mitchum's personality (Barnes $19.95).

Simone Signoret, the French star of such films as *No Room At the Top* and the current *Madame Rosa,* has chosen to tell it all in NOSTALGIA ISN'T WHAT IT USED TO BE, a frank, engaging and very intimate autobiography, with lively comments on the French and U.S. movie industries (Harper & Row $12.95).

In ACTRESS: POSTCARDS FROM THE ROAD, Elizabeth Ashley recounts (with an assist from Ross Firestone) the dramatic turns in her impulse-guided life, where dedication to acting often stood in the way of personal happiness and the demands of an eventually successful career (Evans $10).

Elvis Presley's private secretary, Becky Yancey, adds her recollections of the movie star in MY LIFE WITH ELVIS, written with Cliff Linedecker. It is an honest and sympathetic book that sheds light on Presley's moods, music and women (Warner $2.50).

HOW MOVIES ARE MADE

In THE JAWS 2 LOG, Roy Loynd gives a colorful account of the behind-the-scenes excitement that pervaded the making of this sequel. Directed by Jeannot Szwarc and superbly photographed by Michael Butler, the film's technical problems—among others—make for entertaining and informative reading (Dell $1.95).

Actor Bob Balaban kept a record of his work on the widely-acclaimed film, and publishes it now as CLOSE ENCOUNTERS OF THE THIRD KIND DIARY. It is a revealing and often humorous report, replete with personality items, and well illustrated (Paradise Press $1.95).

A thoroughly researched historic survey of how movies depicted antique times is offered by Jon Solomon in THE ANCIENT WORLD IN THE CINEMA. From the mythological epics that dominated Italian movies to De Mille's *King of Kings* and Fellini's *Satyricon,* some 400 films are discussed in this comprehensive work by an inquisitive writer (Barnes $19.95).

"Underground cinema," its lifestyles, techniques and personalities are brought out in FILM IS, a fascinating book by Stephen Dwoskin. A filmmaker himself, Dwoskin assesses the cultural and sociological nature of independent film production, assembling an important and valuable reference work on the twilight world of "free cinema." (Overlook $6.95).

THE REFERENCE SHELF

Anthony Slide, in ASPECTS OF AMERICAN FILM HISTORY PRIOR TO 1920, surveys appreciatingly many areas of early filmmaking in the U.S. His knowledgeable study encompasses producers, directors and performers of the period, as well as contemporary books and magazines (Scarecrow $7.50).

In an extensive documented array of well-researched facts, Roy Armes' A CRITICAL HISTORY OF THE BRITISH CINEMA presents a broad overview of that country's films and filmmakers. It offers impressive production statistics, a chronology of directors' work, a bibliography, and a thoughtful forecast of the British film industry's future (Oxford U. Press $17.50).

Constance Nash and Virginia Oakley provide aspiring film and video writers with two authoritative manuals replete with sound advice on the essential elements of planning, organizing, writing and selling a script. In addition, THE SCREENWRITER'S HANDBOOK and THE TELEVISION WRITER'S HANDBOOK carry interviews with established pros and excerpts from produced screen- and teleplays (Harper & Row $9.95 ea.).

Calling it "a mirror of American life," editors David Manning White and John Pendleton scrutinize in POPULAR CULTURE the impact caused on public taste and lifestyle by mass entertainment, advertising, communication media and other opinion-molding devices. A stimulating book, with contributions by 57 sociologists, educators, artists and critics (Publisher's, Del Mar, CA 92014; $11.95/6.25).

A valuable technical text by Michael Overman, UNDERSTANDING SOUND, VIDEO AND FILM RECORDING is an expert manual on the equipment and its uses, covering a broad range of situations and offering an historic survey of the media's progress (TAB Books, Blue Ridge Summit, PA 17214; $8.95/5.95).

The popularity of narrow gauge formats and their generalized use—even for theatrical features—is reflected in Bebe Ferrell McClain's SUPER 8 FILMMAKING FROM SCRATCH. Intended primarily for beginning filmmakers, the book provides broader perspectives as it delineates the practical objectives in the planning, shooting and completion stages (Prentice-Hall $11.95/7.95). ■

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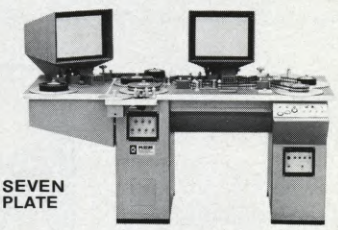

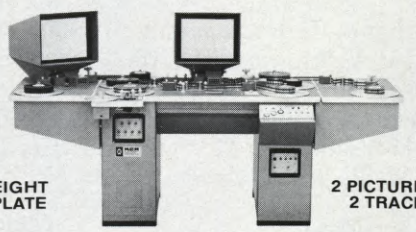

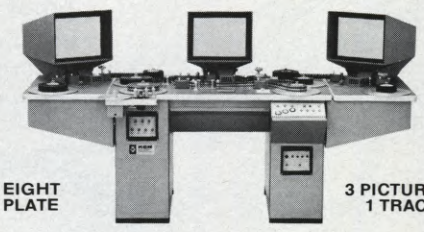

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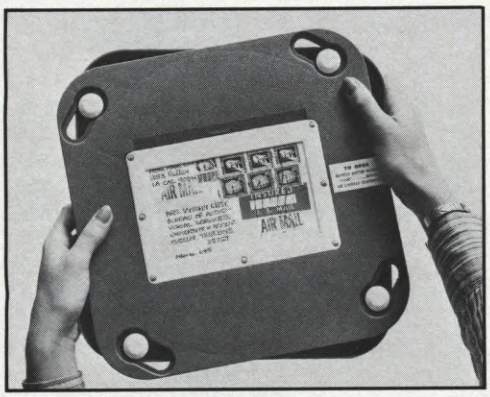

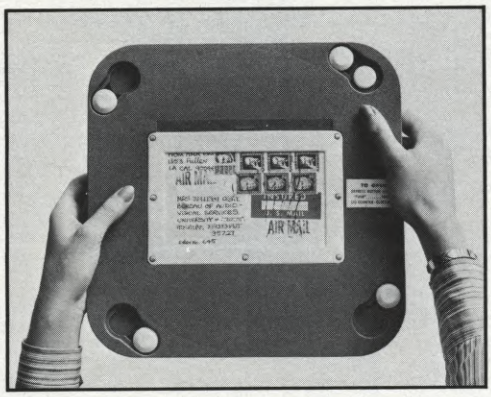

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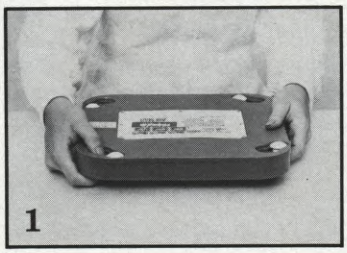

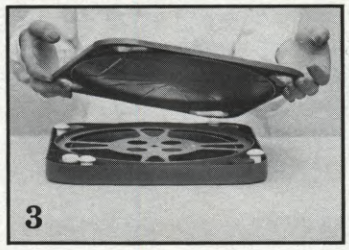

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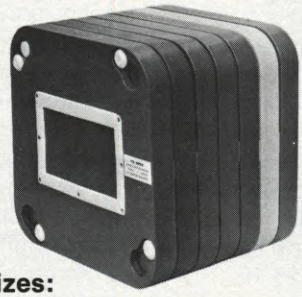

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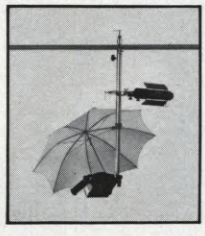

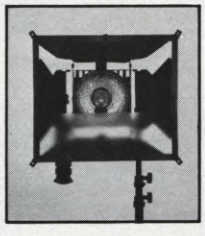

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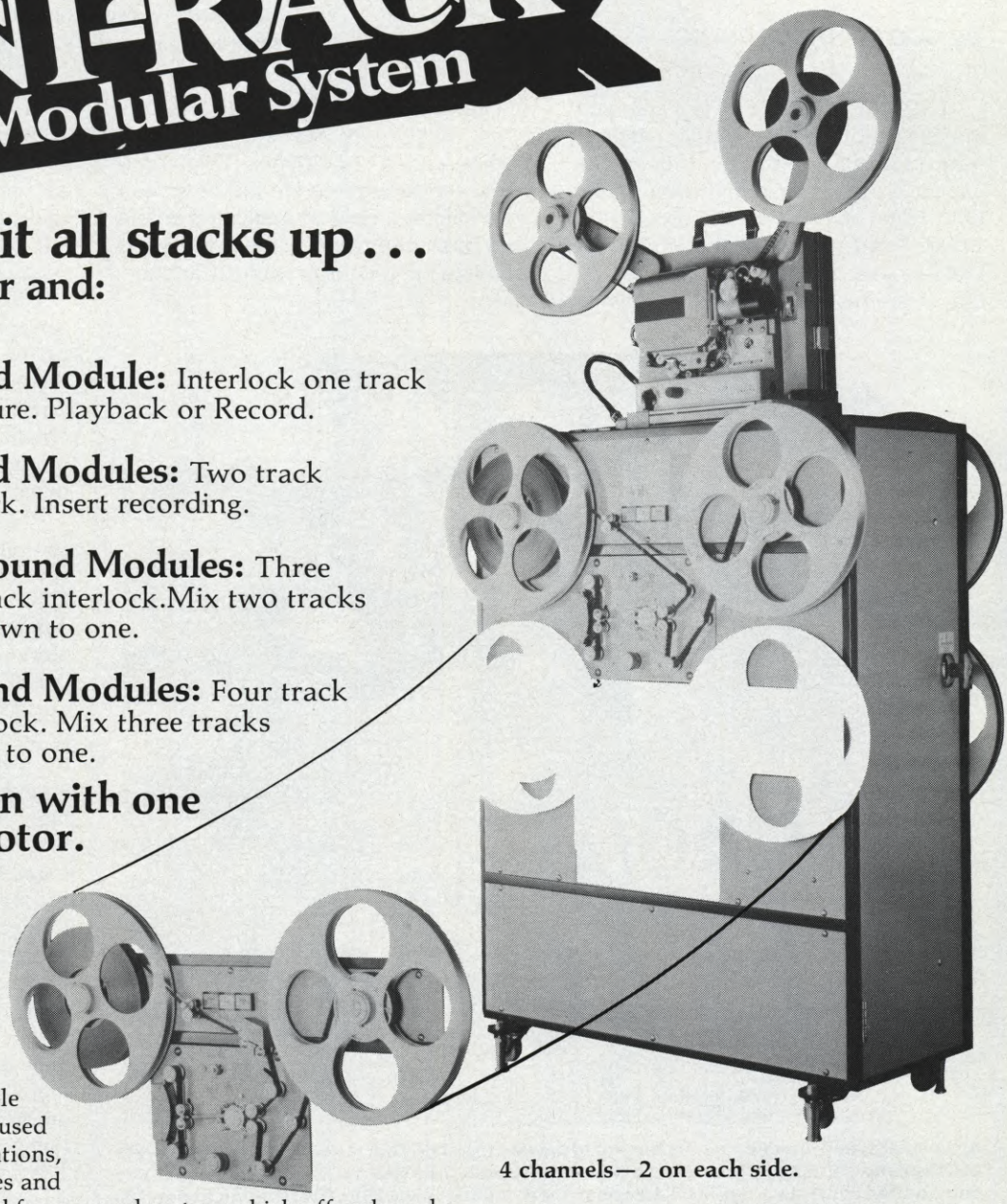

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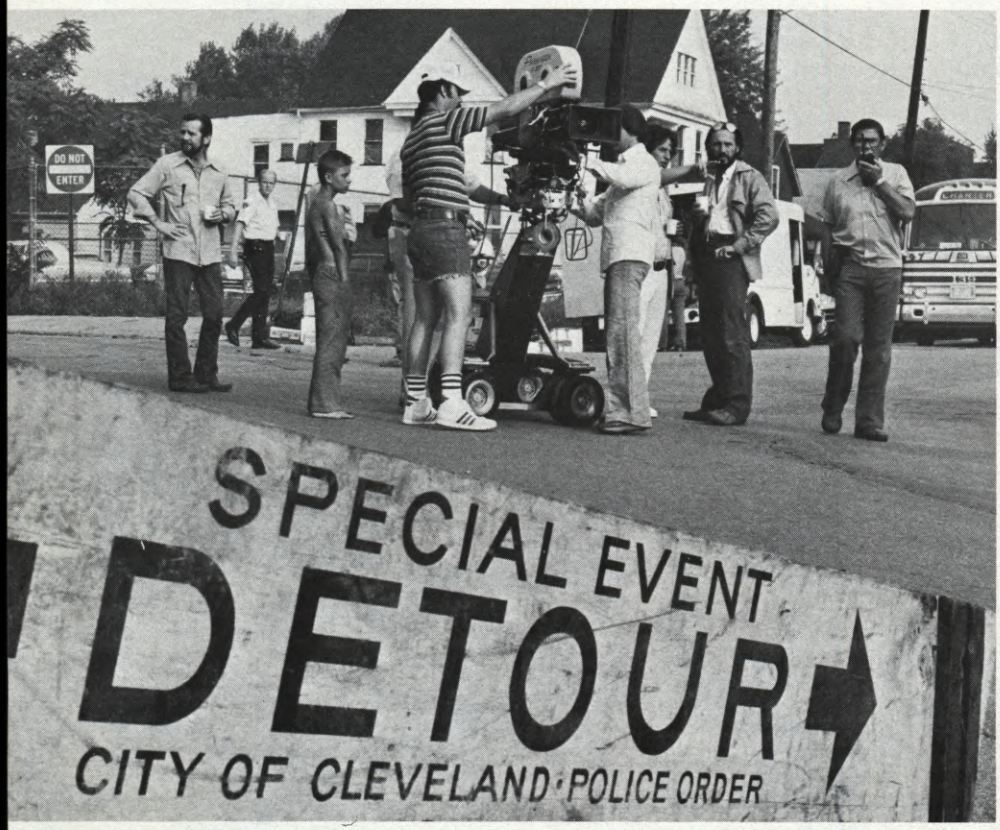
BEHIND THE SCENES OF "THE DEER HUNTER"

A seemingly simple story of five Russian-American steelworkers lights up the screen with a combination of sensitivity and jack-hammer realism that turns it into a dramatic experience of almost epic proportions

By SCOTT HENDERSON

"THE DEER HUNTER" is a stunning motion picture in every respect —dramatically, visually and in its impact on the audience. Produced by EMI Films for release in the United States and Canada by Universal Pictures and by EMI Film Distributors, Ltd. in the rest of the world, the film is the basic creation of writer-director Michael Cimino. It has been superbly photographed by Vilmos Zsigmond, ASC, and brought to life on the screen by a cast and crew of dedicated artists who often had to work under the worst possible conditions of weather and terrain.



A "special event" indeed was the filming of scenes for "THE DEER HUNTER" on the streets of Cleveland's Russian-American community. Actually, this was only one of eight localities composited to create a "typical" American steel-milling town. (BELOW) Hoping to hire 600 to 800 paid extras for downtown Saigon street scenes during the 1973 evacuation, the film company got instead 6,000 curious Bangkok residents who worked for free.

In his fifth time out as a feature screenwriter and second foray as director, Cimino has molded people, places and things into more than realistic elements of storytelling. Without stylistic pretension, they become poignant symbols—sometimes terrifying, sometimes humorous—of American culture and deep-rooted ethnic values. The characters' respective romantic lives, fears and hopes are portrayed across an emotional spectrum ranging from the most delicate sensitivity to jack-hammer force.

Although its most heart-pounding sequences portray the Vietnam war with no-holds-barred realism, "THE DEER HUNTER" ranges far beyond the confines of a war story. It is rather a story of "buddyship", that extremely deep form of masculine friendship sprung from the roots of shared growing up and ultimately annealed in the crucible of war. It is the story of five young steelworkers, Russian by heritage, American by birth, who work and booze and brawl and hunt deer together and share a very special kind of love. Observing the sentimental traditions of Mother Russia, but fiercely American in their patriotism and pride of country, three of them march steadfastly off to war—where the sufferings they endure become almost unbearably grueling to observe. In the end there are death and broken bodies, but an almost jubilant reaffirmation of the human spirit.

Aside from what it does for and to the audience—which is considerable—"THE DEER HUNTER" is an unspoken salute to the dedication, determination and sheer uncompromising perfectionism of the highest echelon of modern-day filmmakers. Seared on location by the blistering heat of the hottest American summer in 20 years, chilled to the bone in the frigid clouds of the Cascade Mountains, sweltering in the poisonous snake-ridden jungles of Thailand, turned blue in the freezing waters of the River Kwai, many of the crew members cracked up physically and psychologically. Yet there are no signs of this stress and strain on the film itself. Made with obvious tender loving care, it is flawless in its technical quality.

Continued on Page 1011

The extremely impressive wedding sequence for "THE DEER HUNTER" was filmed inside the beautiful St. Theodosius Russian Orthodox Cathedral in Cleveland, considered to be the finest example of Russian church architecture in America and a national historic shrine. It is said to be an exact replica of the Czars' cathedral within the walls of the Kremlin. Church officials were understandably reticent about granting permission for the filming, not only because of possible damage to the premises, but because of their concern for authenticity (they expressed outrage at the lack of same in "DOCTOR ZHIVAGO"). After being assured by the filmmakers that authenticity would be scrupulously maintained, they extended their fullest cooperation.

Since the main characters in "THE DEER HUNTER" are all steelworkers, it was necessary to show them at work in their characteristic environment. The officials of most steel mills who were approached for permission to film on their premises refused, so fearful were they that pollution-producing details would be picked up by the camera, but the officials of the Central Blast Furnace of U.S. Steel's Cleveland facility liked the script and granted permission to shoot there. Robert De Niro and other actors were coached to perform the actual operations.

(LEFT) Thailand was selected to double as Vietnam for the filming of war sequences, and battle action was staged in some of the most remote areas during the monsoon season. Although the government had extended permission, a change of regimes in mid-filming made the situation very tenuous, and actual fighting was going on at the border at the same time. (RIGHT) By a waterfall in the Cascade Mountains, Robert De Niro sits pondering the changes wrought in the character he plays by the Vietnam War. Once an avid deer hunter, he lets the deer go free when it appears in his sights. He can no longer kill.

ORDEAL BY FIRE AND ICE

A man with a cinematic vision leads a dedicated cast and crew through blazing heat and freezing cold in order to tell his powerful story of simple people portrayed on a vast canvas

By MICHAEL CIMINO
Screenwriter/Director

As a film project, "THE DEER HUNTER" began in a very interesting and unusual way. I was approached by EMI Film Distributors, Ltd. about a project they had that they wanted me to direct. Theirs is an English company which was just preparing to do their first three American productions, wholly financed by themselves. They had previously co-financed various American features, but now they were about to actually set up in America and begin their own production.

I met with the EMI people and read the material that they had. I told them I wasn't interested in doing that particular script, but that I did have a notion about a film to be called "THE DEER HUNTER". I sat down with them for about two hours and told them the story and, amazingly, they said, "Go make it."

My response was one of total disbelief. I said, "What do you mean, go make it? We don't have a script." They said, "We would like to make the picture. Do whatever you have to do to get it rolling." They set a start date. Now, this was a meeting that took place in mid-November of 1976, and they wanted to begin shooting the following March. I had just come from an aborted project at Paramount and I brought with me the man who had been working there with me as Assistant Art Director. I immediately dispatched him to Thailand, the Philippines and various places throughout east Asia. I sent another unit off to the Cascades in Washington.

I took off with Charlie Okun, who had been my long-time assistant back east, and everyone had long lists of locations—but no script. I said, "Don't worry about it. Just find these places; we'll need them for the story." Then I began working on the script—in airplanes, trains, buses, cars and in motels at night. As we came across various places in the process of surveying locations, the script began to change. We were actually laying out the physical production and writing the script simultaneously. As a result, the script, instead of describing locations that had been conjured up, described real places.

When Bob De Niro became interested in the material, the first thing he wanted to do was see the locations, because they had been so vividly described. So Charlie Okun, Bobby and I took off on a whirlwind tour, incognito. De Niro couldn't believe it, because where it said in the script: St. Theodosius' Russian Orthodox Cathedral, or Welch's Bar or Commercial Street—there were the places that had been described. Normally that does not happen. Even when we got to Thailand, the crew was amazed to find the locations exactly as described in the script. The people on the crew who didn't know how the production had evolved kept coming up to me and asking, "How did you find places that match the script so perfectly?" Well, it was really the other way around. The script had been written to places that already existed.

When we made our first trip east to the Ohio River Valley, we encountered the worst winter weather they'd had in 20 years. The irony was that we surveyed the film in the coldest winter in 20 years and shot it in the hottest summer in 20 years. Naturally, as always happens, we ended up shooting summer-for-winter.

We met a girl who was living in the area and was very new to filmmaking, but was retained by the Ohio Film Commission at that time. We got to know her family and friends and the whole wedding reception sequence evolved out of conversations with her. I began writing that sequence on the spot, based on her recollections of weddings that she had attended.

Admittedly, this was an unusual way for such a large project to develop. Actually, it didn't start out to be such a large project. It just kept growing and, fortunately, EMI constantly supported it—which was also unusual. They never asked for one thing to be cut. They even went along with us when we were stuck in the clouds for two weeks at 9,000 feet on Mt. Baker in the state of Washington and couldn't see anything during that time. They were also very understanding when we got to Bangkok and ran smack into the monsoon season. The city was under three feet of water many nights and the River Kwai sometimes fluctuated 30 feet within a 48-hour period. Even so, EMI never demanded that there be any stinting of quality on the production.

"THE DEER HUNTER" was an enormously difficult picture to make for all of the obvious reasons, but mainly because I had decided early on to work only in real locations and to go to places where film crews had not shot before. I believe that

(LEFT) "THE DEER HUNTER" is the story of a group of young steelworkers decisively molded by their environment. For this reason, it was necessary to show the steel mill looming in the background of almost every exterior shot. Actually, segments of eight different steel towns were filmed in order to composite the single community portrayed in the film. (RIGHT) A dolly shot establishes the grounded trailer in which the main character supposedly lives.

point to be very important. I feel that working in locations where 12 films have preceded you creates a certain staleness. There is an inherent cynicism that is hard to fight. But when you go into a new place, the local people are so enthusiastic and so cooperative. They care so much about what you're doing that it rubs off on the actors and the crew, and is reflected in the quality of the resultant film. It's not possible to purchase that kind of enthusiasm. If you had three times the budget you couldn't buy the enthusiasm and love that the local people develop for an enterprise like that.

I remember very well the occasion when we first went to talk about using St. Theodosius' Cathedral as a location, which was in the dead of winter. The church council had decided to have the meeting in their recreation hall, which was somewhere outside the city and buried under 20 feet of snow. The snow was falling very softly that evening and there were pine trees all around. As we walked inside, we heard the sound of 20 balalaikas playing very softly and it was like walking into Russia. All these children, 10 and 11 years old, were taking balalaika lessons. The church council was composed mostly of old people and very young people—the grandparents and the children—because, as has happened throughout most of America, the parents had walked away from their heritage. The grandchildren relate more to their grandparents than their parents did. It's the grandchildren who are playing the balalaikas and learning the folk dances and speaking the language.

The man who was the president of the council said, "These people are from Hollywood and they want to make a film here. Ask them anything you want, because we have to make a decision as to whether we are going to let them shoot in our church."

The church is very important to them because it is reputed to be the finest example of Russian church architecture in America. It is actually a national historic shrine. Most people have no idea that it even exists and that it is a replica of the Czar's church inside the Kremlin walls in Moscow. It has been lovingly preserved and the people there are dedicated to it. They care about quality.

The first question asked by one of the council members was: "Well, suppose we tell you that you can shoot in the church. What happens if we have a funeral on that day?"

It was so unexpected, but I explained that we have such problems all the time in shooting and that we would just work around it. Curiously enough, the thing they were most concerned about, and

"THE DEER HUNTER" is Michael Cimino's second venture as writer-director, although it is his fifth as screenwriter. His first screenplay was written for Doug Trumbull's "SILENT RUNNING". Clint Eastwood then hired him to write the "DIRTY HARRY" sequel titled "MAGNUM FORCE". Eastwood next demonstrated his complete confidence in Cimino by selecting him to debut as the director of "THUNDERBOLT AND LIGHTFOOT", from his original story and screenplay.

didn't want to happen again, was what happened with "DOCTOR ZHIVAGO". They said, "That was a film about Russians, made with English actors, with music by a Frenchman, a Russian poet played by an Arab, a Russian heroine played by an English girl, and no Russian music in the entire film."

They were furious about that—a picture that had been made years ago. I couldn't believe what I was hearing, but I said, "I intend to do this authentically, with singing in the Russian language. I grew up with a lot of people of Russian background and I was Best Man at a wedding just like the one in the picture. I've always remembered it as the most beautiful wedding I ever attended. The singing awas marvelous."

Strictly by strange coincidence, the choir director at St. Theodosius in Cleveland had been the choir director of the church in which I had been Best Man. In order to get the authenticity we wanted, we had the choir rehearsing for three months prior to the shooting of the film. We also sent all of the actors to Cleveland to study Russian folk dancing and they worked morning, noon and night to learn the dances.

We held our casting sessions in a big hall and had the local band that plays at their weddings come in and play the Russian folk dances. Whole parishes came in, hundreds of people, and I chose every single face that appears in the film. We took Polaroid pictures of everybody and made up a huge file of photographs. They would come into the hall in groups and dance and then we would say, "Cut! Stop the music!" They would boo and hiss because they wanted to keep on dancing and we would have to start the band up again. They were out having such a good time, with the beer and sandwiches and all, that they didn't want to stop.

We never treated the people simply as extras. Everybody was photographed every time we shot a scene that involved any number of people at all, even if it was five or ten people, and they were all chosen especially to be in our scene.

There is a scene in the wedding recep-

The wedding of the youngest of the five friends takes place in the lush precincts of St. Theodosius' Cathedral, located in Cleveland, Ohio.

tion sequence that shows a table loaded with gifts, and so that these wouldn't look like they came from the prop department, we asked each one of our local people to wrap a package, with the understanding that we would reimburse them for the wrapping. They became so involved with the project that they brought *real* gifts—coffee pots, toasters, blenders, money in envelopes, everything. We had a terrible time, because we couldn't figure out who gave what and we had to return them.

That's the kind of feeling you can get in a place that has not been used over and over again for filming. There is such a specialness to working in that kind of situation. It rubs off on the crew; it rubs off on the actors; it rubs off on everyone involved with the enterprise—and makes it a different film.

We had a very similar experience in Thailand, where people got involved in the same way. For instance, when we staged the siege of the American Embassy, we had the reporters and journalists who had actually been in Saigon at the Embassy on that day. By some accident of fate, they all happened to be in

This magnificent stag, at first the prey of the title character, later becomes to him a somewhat mystic symbol of free, living beauty.

(LEFT) Cimino gives direction to Robert De Niro, who lived incognito among steelworkers for weeks in order to absorb their thought and speech patterns. (RIGHT) Like knights in some sort of strange armor, the young steelworkers don their silvered, heat-reflective garb to tend the flaming furnaces. (BELOW LEFT) Cimino, feeling that the trained deer looked too domesticated, had two wild stags shipped from the east to Washington state location. (RIGHT) Getting the wild stags to take direction was something else again.

(LEFT) A combination of white reflective cards and HMI lights was needed to balance the intense sunlight at the 9,000-foot level on Mount Baker in the Cascades. (RIGHT) The Washington location was chosen to simulate the Allegheny Mountains locale because it is one of the few locations in America that has snow in the glacier fields all through the summer. However, the company was immobilized for almost two weeks by low-lying clouds that shrouded the location.

Bangkok and we had them in exactly the same positions doing exactly the same things that they were doing on that day in Saigon. Again, it lent a certain quality to the sequence; it influenced the action. They got excited and they got the people excited. This sort of thing makes for a kind of chain reaction which you can't get unless you have that. It creates a specialness.

In order to fully portray the little steel town in which the main characters live, we literally had to create a town, because invariably wherever we went, no one town had all the elements—the church, the supermarket, the bowling alley, the steel mill. I wanted the looming presence of the steel mill always towering above the town. We found one town that was great, but they had torn the steel mill down. We found another place that was perfect, but they had no church. They were all lacking something, so I decided to take a tremendous gamble and create the ideal town from eight different towns.

As a result, we have interiors in one town and exteriors of the same "sets" 400 miles away—involving all the problems that would naturally create. We

Continued on Page 1006

(LEFT) De Niro mans a flamethrower in graphic portrayal of Vietnam combat. (RIGHT) The frantic evacuation of the American Embassy in Saigon was restaged in Bangkok, using journalists and correspondents who had been present at the real thing. Due to official pressures, the complicated sequence had to be filmed on the morning of a single day. (BELOW LEFT) After escape from Viet Cong prison camp, the POWs cling to a floating log. (RIGHT) Refusing to abandon his badly wounded buddy, Michael (De Niro) hoists him up on shore.

PHOTOGRAPHING "THE DEER HUNTER"

The challenge included shooting inside a cramped trailer, an immense cathedral, a steel mill, the icy slopes of Mt. Baker, the jam-packed streets of Bangkok and a raging river with water up to the matte box

By VILMOS ZSIGMOND, ASC

One of my biggest problems in photographing "THE DEER HUNTER" was trying to get a cold, rainy, autumn look for the steel mill areas around Pittsburgh—while shooting in the middle of a very hot summer. We had hoped to find locations where there were no trees or vegetation, but unfortunately there were lots of trees and grassy areas in the Ohio River Valley locales where we had to shoot. The only solution was to defoliate the trees and change the color of the grass—which we were able to do, thanks to the skill of a terrific greens man and special effects expert. They sprayed the grass with certain chemicals and two weeks later it turned "California brown"; I couldn't believe it.

The trees were more difficult, because the leaves actually had to be stripped off of them, and we were afraid that the trees might die. For example, surrounding the cathedral in Cleveland where the wedding in the film takes place there were many trees that had to be defoliated and we were afraid the leaves would never come back. Later, when we were shooting in Thailand, we got a letter from the priest, who wrote, "Don't worry. The leaves are on the trees again." That made us feel very, very good.

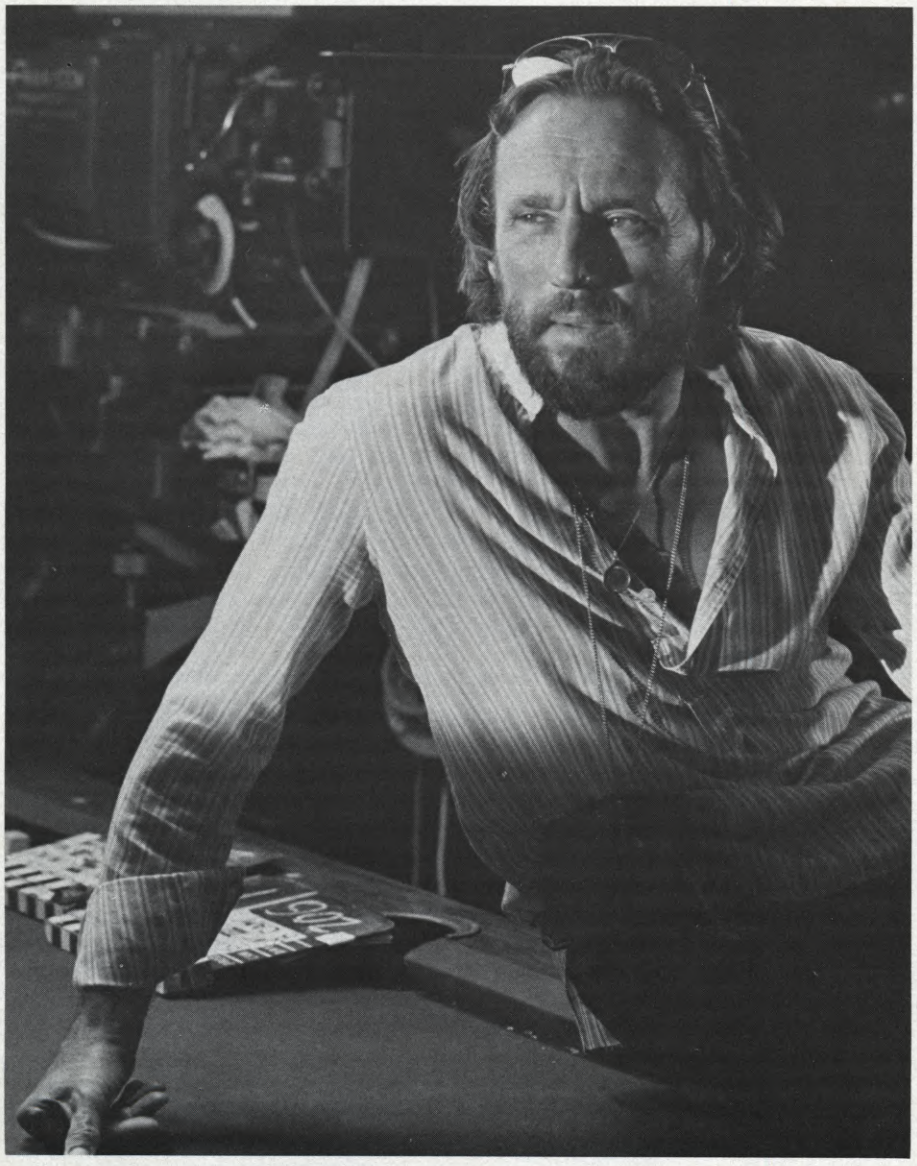
Besides taking the green out of the landscape, we also tried to enhance the autumn feeling by wetting the streets down all the time. That helped a lot to create a cold feeling, especially when the sun was not out. However, since we couldn't depend upon overcast weather all the time, we had to shoot many scenes when the sun was not yet up or when it had already gone down. Printing those exterior scenes toward the blue side later helped give them a cold look. By way of contrast, we printed the interiors warm.

I didn't do any of that color modification in the camera—like using coral or 85 filters on the lens—because there were times when I needed all the exposure I could get. I always believe in getting the maximum amount of light onto the film, because that gives me the opportunity to use smaller lighting units and a better f-stop for achieving a greater depth of field. I always rely on the lab when I have certain color effects in mind and I talk it over with their technicians in advance so that our dailies will be printed that way. My friend Skip Nicholson at Technicolor did a marvelous job in helping me get the right colors all the way through the picture.

As I've said, we used blue to create a cold exterior feeling and warm brownish tones inside. But when we had windows or open doorways in an interior shot, we made an attempt to actually mix the two colors by mixing light, so that the exterior background visible through the windows looked bluer than the inside. We didn't use 85 gels on the windows, as we usually do, but we still got the look that we wanted. This technique proved to be a simpler way of handling the situation—and a lot less work. I hate gelling the windows anyway, because I can always detect the reflection in the gels. Even when you are using the good heavy plastic sheets, double reflections make it obvious that there are gels on the windows. I try to avoid them as much as I can. I'd rather use the mixed color light technique nowadays.

Inside the trailer (which is where the character played by Robert De Niro was supposedly living) the temperature was always well over 100 degrees—and the actors were wearing winter clothing. They would start to sweat immediately and our biggest problem was to keep the perspiration from showing in the

In his first assignment after winning last year's "Best Achievement in Cinematography" Academy Award for "CLOSE ENCOUNTERS OF THE THIRD KIND", Director of Photography Vilmos Zsigmond, ASC, tackled "THE DEER HUNTER". Stimulated by the wide variety of diverse locations and technical challenges, he survived conditions that laid many other crew members low.



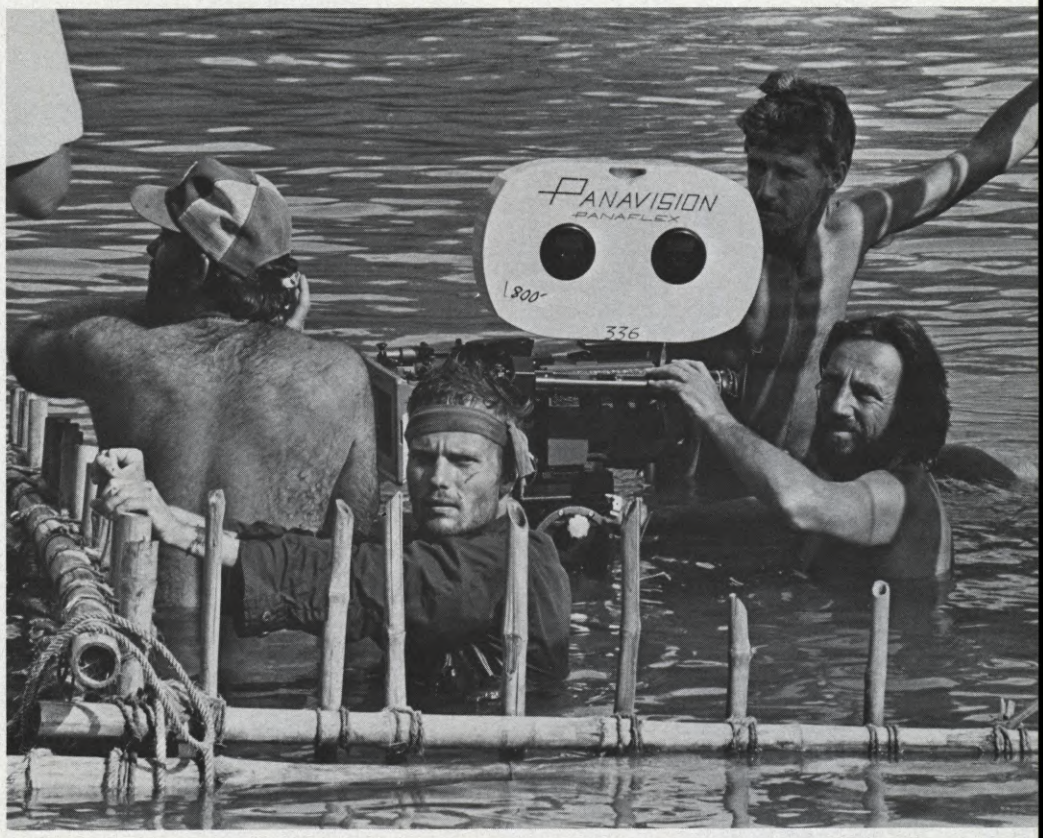
closeups. My operator had to watch that very carefully through the lens and we had to repeat shots quite often because of it. We didn't have an air-conditioner for the first few days, and when we got one, it didn't work. That caused some delays in shooting and they finally had to ship in a very large air-conditioner to get the temperature down to a more comfortable 85 degrees.

I didn't use much diffusion on this picture—in fact, I don't recall using any at all—because we wanted to make the images look very sharp. On the other hand, I used the zoom lens a lot, which gives you a little softer rendition of faces, and I used regular soft lighting, especially in the closeups. For the exteriors we used overcast a lot, which by its very nature produces a nice soft look. But this in combination with sharp lenses minus diffusion added up to a realistic result.

I purposely did not want the "poetic" look that I had become known for in some of my earlier films—especially since we would be filming Vietnam war sequences that had to have a harshly realistic documentary feeling. I didn't want to end up making two different films at the same time. Therefore, I knew there would have to be some kind of visual connection between the American and Vietnam segments of the picture. Avoiding the use of diffusion helped in that respect.

As far as lighting was concerned, I used the same basic techniques that I always use—namely, trying to make the lighting look as realistic as possible. I really believe that light should appear to be coming from a realistic source. In a daylight interior scene, it should seem to be coming through windows or doorways. In a night interior, it should appear to be coming from practical fixtures in the set. I always make an effort to confer with the art director when he is designing the sets so that he will give me enough light sources to play with. It makes the cameraman's life much easier when the art director establishes nice light sources for him, so that he can shoot in any direction and justify a key light or a kicker or a backlight. I like to use lighting to create a mood and that's much easier to do when you have visible light sources working for you.

Speaking of lighting, the steel mill sequence presented quite a challenge, because when the flowing melted steel comes from the furnace it emits a tremendous amount of light. The problem was mainly one of balance, because we didn't want our actors to go completely into silhouette. We wanted the audience to be able to recognize Robert De Niro and the others as actually being in the scenes—which they were at least half the time, although we used real steelworkers in the long background shots.



If Panavision President Bob Gottschalk could only see his Panaflex now! Standing in the frigid waters of the River Kwai, actor John Savage, Cinematographer Zsigmond and other crew members prepare to shoot a Viet Cong prison camp scene. The river, fed by mountain streams, was so cold that personnel literally turned blue and finally had to don wet suits.

This meant that we had to add light supposedly coming from other sources, such as practical light bulbs and the outdoors. We used 9-unit FAY lights with 3200°K globes to bring the level up to 400 or 500 footcandles for shooting at about f/8. For the background, since those furnace sheds are open on the sides, we tried to shoot against real daylight. Of course, since we were shooting primarily for the inside look, the outside went slightly toward the blue, which was very nice because that sequence followed an earlier dawn sequence that had been given a rather bluish cast to simulate a winter sunrise effect.

While it looked as though there was a lot of daylight coming through in the background, we actually had to supplement it through the use of several 2500-watt HMI lights. We used these relatively small daylight sources mainly for convenience. Because all of the equipment had to be brought up on ladders or small elevators, we couldn't use Brutes or any other huge, heavy equipment. Also, we could plug the HMI lights into existing electrical circuits—which was a great help, because we couldn't even get our generator in there.

As I mentioned before, the balancing of the light was the main problem in the steel mill, because when you aim the camera at flowing molten steel, you are really talking about photographing the sun. It is so hot that you really can't get an exposure for it, so all you can hope for is to get interesting compositions of the flowing steel and let it glow a bit on the film. The reason we needed so many footcandles of added light was to be able to stop the lens down so that the steel would not burn up and appear white. We wanted a flaming orange color and we tried to keep the lighting key high enough throughout the sequence to maintain that color consistently. For the same reason, we used 3200°K lights to key our people and the 85 filter on the lens also added a built-in orange quality. For filming the actors in that sequence we used half MT-2 gels on the lights to get an even warmer glow and added a flicker effect so that the light would appear to be coming from the flowing "lava" of the molten steel.

In the steel mill (and later when shooting in Thailand) we were afraid that the intense heat (up to 180 degrees inside the mill) might damage the film, but nothing at all detrimental happened to it. The results were just beautiful, so it would seem that the 5247 film is probably insensitive to heat.

We shot in eight different towns and it was essential to have the steel mill in the background as much as possible, since it

Continued on Page 1012

Scene from Columbia Pictures production of "Close Encounters of the Third Kind."
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"When you're dealing with such high heat, you must have a color medium that will hold up, and my experience is that Roscolux will do just that." —Vilmos Zsigmond, A.S.C.

Vilmos Zsigmond, A.S.C., Academy Award Winning Director of Photography

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Vilmos Zsigmond, Academy Award winning Director of Photography for *Close Encounters of the Third Kind* said, "To achieve the intensity of light and color necessary for this scene, I used HMI lights, dozens of brutes, and Roscolux. Roscolux handles the heat! When you're dealing with such high heat, you must have a color medium that will hold up, and my experience is that Roscolux will do just that. Rosco also makes available to me a vast array of color which lets me get just the effect I want."

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A ONE-MAN FILM AND SYNC-SOUND SYSTEM

About the ingenious combining of an Arriflex 16SR camera and a Nagra SNN miniature recorder to create a compact, portable, lightweight, self-contained, double-system filming package

By VICTOR DUNCAN, ASC

The concept of a single instrument to shoot pictures and record a double-system sound track is not entirely new. As long ago as the late 1950's, Magnasync, among others, offered sprocket-driven recorders which mounted permanently on the underside of an Auricon or Bolex camera. They were mechanically coupled with the camera for double-system sync, and became a combination camera/recorder unit. They were not too portable, however, and therefore did not offer the greatest advantage over conventional, separate picture and sound equipment. I think only a small number were made.

Things are quite different now, however, due mainly to technological advances in camera electronics, tiny but high quality recorders, and crystal modules for control.

Therefore, when a prominent producer of anthropological films came to us with his problem, we listened. He wanted to shoot with double-system sound quality out in the wilds, without having a multi-person film crew which attracts attention and detracts from the cultural life-styles being studied. The traditional approach was unfeasible in a tropical rain forest. One man could not possibly handle a camera and a sync recorder, let alone the tangle of cables and slating equipment. Even communication between cameraman and soundman was enough to disturb the natural behavior of primitive subjects. What was needed was a self-contained camera/recorder package that was easily portable and trouble free, and which could be handled by one person.

As a result of our consultation with the customer and a study of the plans and prices, Victor Duncan, Inc. was selected from several equipment suppliers to assemble the package. Bob Burrell, in charge of engineering, undertook the project.

Jerry Poppenhouse, Phillips Petroleum Company cameraman, on location with the Nagra Caddy System, which has as its components an Arriflex 16SR camera, a Nagra SNN recorder, and a crystal module for sync, bloop and start/stop of the recorder. With the restrictions of limited space, the Caddy allows a one-man crew to record quality sync-sound under adverse conditions.

Robert Poppenhouse shooting for Phillips Petroleum on offshore drilling rig. The Caddy is used to record both sync and wild sound in the tight quarters of such a rig under conditions that do not permit the luxury of a multi-person film/sound crew.

The basic components of the Nagra Caddy System are an Arriflex 16SR camera, the Nagra SNN recorder, and a crystal module for sync, bloop, and start/stop of the recorder. The Arri 16SR camera was an excellent choice, for it not only provided a modern, reliable and highly portable camera, but it turned out to be an easy camera to deal with when we found that we had to increase the camera start up (bloop) time to one full second

from the standard 400 msec. With the Arri SR, this required only an electronic modification.

One requirement was that all functions of the ultra-compact unit would operate from the camera trigger. That is, with one squeeze of the pistol grip switch, the camera must start, the recorder must start, the one-second 1000 Hz bloop signal is applied, and a 30 Hz crystal sync signal starts. This was readily accomplished with the basic components mentioned above, and would have been impossible without totally new inventions as recently as three or four years ago.

The salient feature was to be that of combining a high quality double-system sound device with the camera at minimum weight and bulk, in order to preserve the portability. We therefore fabricated a welded box of aluminum to provide a mounting platform for the recorder and electronics, and to provide some protection for them while in use. The components are mounted between rails with Velcro. A shoe is available for use with microphone accessories if needed. The box follows the contour of the magazine with finger room in between so that magazines can be changed without removing the Caddy. The total weight of the Nagra Caddy, including the SNN recorder is only 2 lbs., 8 oz.

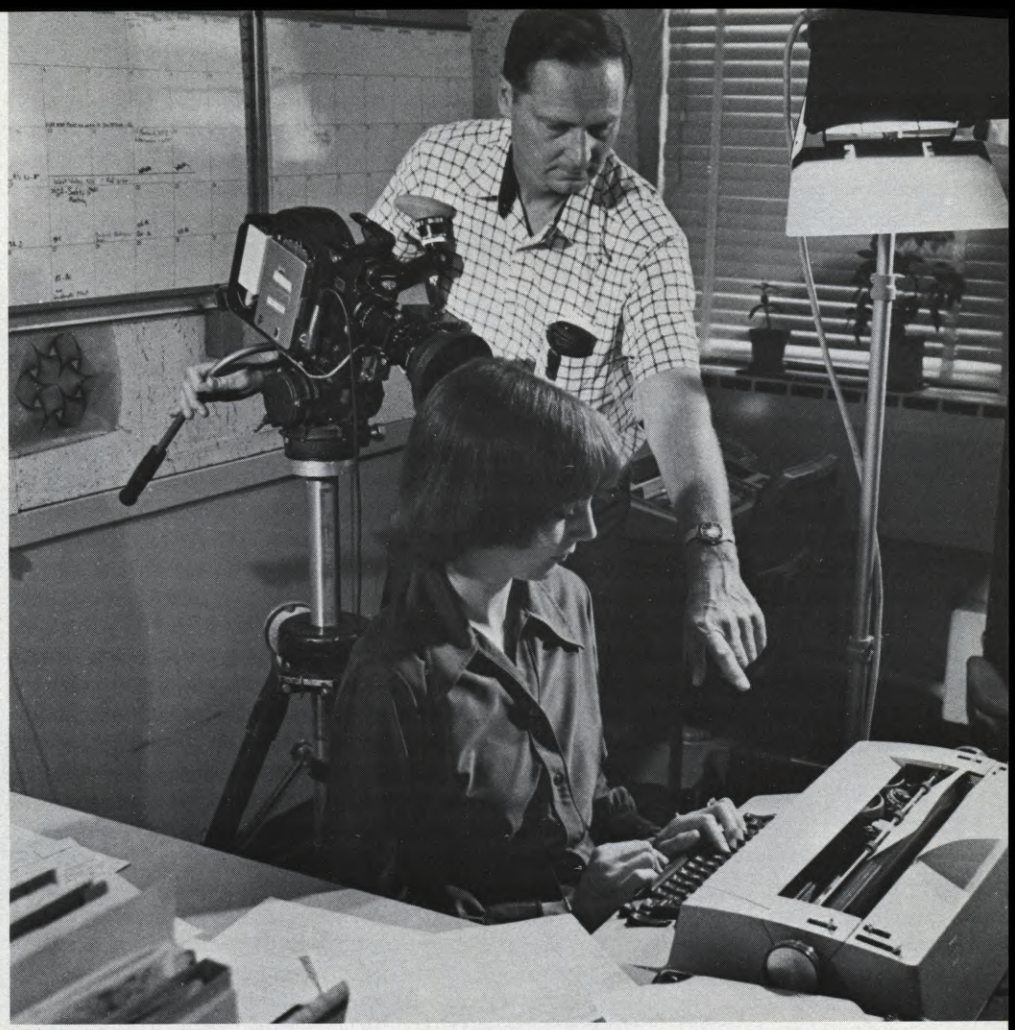
The electronic module for the recorder provides the following:

A. A 30 Hz crystal reference.
B. A 1000 Hz oscillator tone (bloop), cued by the camera.
C. An auto-start function which starts the recorder when the camera is turned on.
D. A separate switch to start and stop the recorder independent of the camera.
E. "Out of Sync" and slating indicator light.

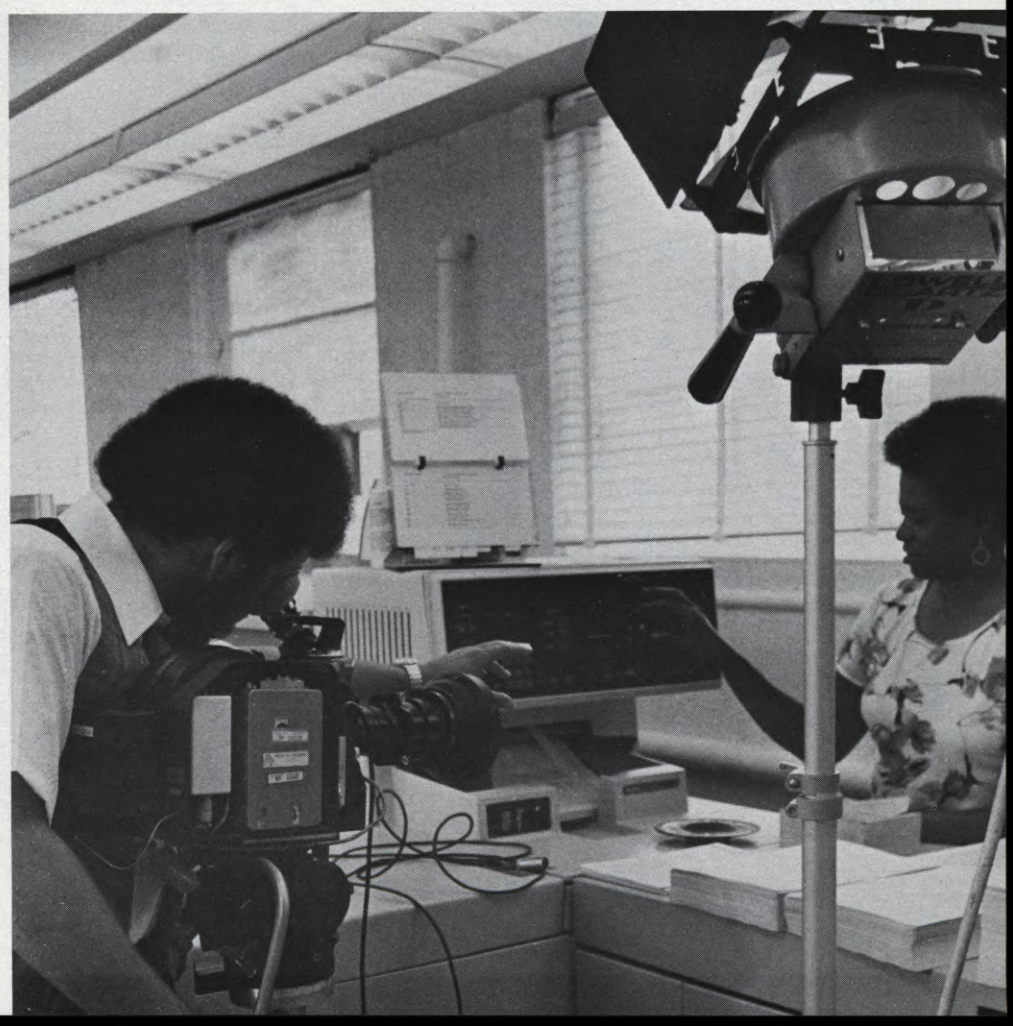
The recorder is a standard Nagra SNN. Its operation and all of its controls are usable when installed in the box.

On a moments notice, the entire Nagra Caddy can be detached from the camera and used as a conventional separate recorder. Installation or removal involves only the sync-pulse output connector at the camera and one thumb screw, about a ten-second operation. Both camera and recorder are then completely separate units and can be used independently.

This same modular concept is being used to develop an even smaller Nagra Caddy for use with the Cinema Products GSMO Camera. This new configuration will mount the recorder between the camera base and the shoulder pod. Production is scheduled for the Fall of '78. ■



Norman Abderhalden, Argonne National Laboratory cameraman, shooting training film. The Caddy is used to record the typist's remarks as she explains what she is doing, while camera films closeup of her hands on typewriter keys. The film/track ratio is nearly one-to-one. (BELOW) Robert Long, Argonne National Laboratory cameraman, using the Caddy to record sync-sound of a business machine to lend presence under narration.



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If the zoom range is long, we will supply a motorised control system. If no manual control bars are provided, we will fit them. If they don't focus closer than 4 or 5 feet, we will provide diopters. If the manufacturer doesn't supply a sunshade, then it will be made by us. Also the lens must be cased; no-one ever takes a lens out of Samuelsons without its being properly protected.

The latest lenses we have to offer are the new short range ultra-wide aperture Angenieux, 2.8x16 16-44mm, T1.8 and the new super-quality Cooke Varokinetal 9-90mm T2.5. Both lenses are just what you need when you need them.

There are also two interesting add-on units available from Angenieux. A wide-angle attachment which turns the 16-44mm T1.3 into a 12-34mm T1.6 or the more familiar 10x12 12-120mm into a 9-50mm and the 15x10 10-150mm into a 7.5-112mm.

Also there is a telephoto add-on attachment by Angenieux. This converts the 16-44mm into a 55-77mm, the 12-120mm into a 75-200mm and the 10-150mm into a 63-250mm.

All useful lenses and all are available through Samuelsons of London.

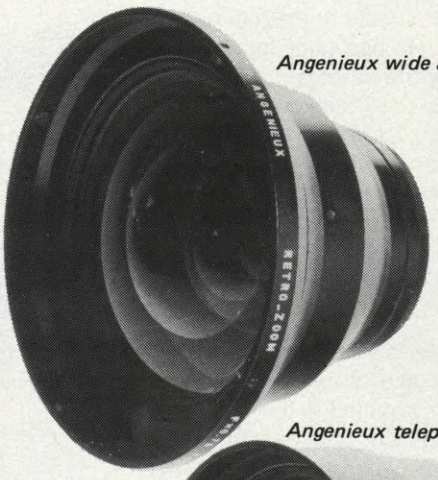
It always takes a little time to get new equipment into service. Although many manufacturers give us a certain amount of priority on deliveries, because they know that their recent products will obtain the widest circulation through us, there is always much else to be done before it is up to our standards.

In the first place, all new equipment is subjected to the very strict quality control test routine. Only the best is good enough for our clients.

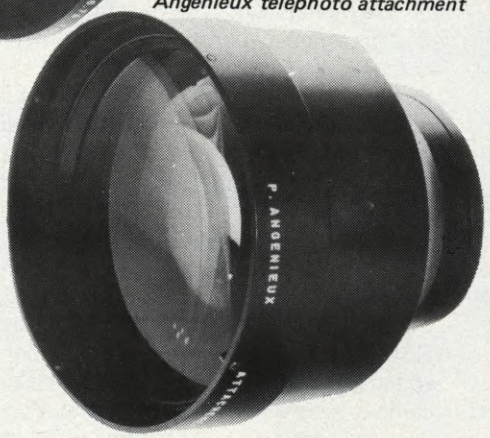
When it comes to lenses, we invariably have to sort out the interchangeability of lens mounts. Our 16mm lenses, for instance, must all be able to be fitted onto Aäton, Arriflex, Beaulieu, Bolex, Cinema Products, Eclair and Photosonics cameras. If the lens is heavy, we must make support systems that interface with every make of camera on to which it may have to be fitted.

Then there is the problem of filters. It is surprising how many lens manufacturers forget that it is impossible to film with negative colour film stock in daylight without a colour correction filter, and that a lens which does not stop down smaller than T11 or 16 will invariably require a neutral density filter when shooting in direct sunlight. From Samuelsons you can be sure that any lens we supply is capable of being filtered.

Angenieux wide angle attachment



Angenieux telephoto attachment



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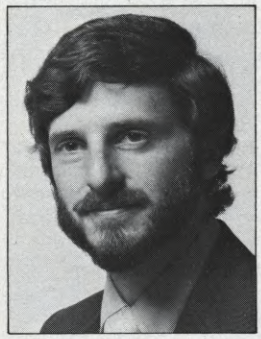

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THERE'S MORE TO "CLEAR PICTURES" THAN MEETS THE EYE!

Noted travel lecturer, cameraman and cinema engineer goes into explicit detail regarding the various factors involved in getting the sharpest possible 16mm pictures onto large theater screens

By KENNETH RICHTER

(EDITOR'S NOTE: The film lecture business, which began with Burton Holmes in 1897, flourishes today, with more than 20,000 programs presented each year, to an audience estimated at 15,000,000. The filmmaker presents the film, live, with his spoken, usually unwritten, narration. It is a special area of show business that requires a special combination of talents. Recently, your editor was having an after-show snack with film lecturer Ken Richter in a Hollywood restaurant. A man who had just seen Ken's show at the Ebell Theater came to our table, said how much he had enjoyed "O CANADA" and especially how much he appreciated the clear pictures. Then he asked "How do you get such clear pictures? Is it the clear air in Canada?" Whereupon, to the gentleman's astonishment, both of us broke up. Finally, we agreed that the air had something to do with it, but there is more to clear pictures than meets the eye.

Ken is one of the top technicians in the film lecture field, a member of the SMPTE Projection Standards Committee, and has been one of the most innovative in the development of equipment to improve image quality. We asked him to distill his experience in this field for American Cinematographer readers.

HERB A. LIGHTMAN)

Standards in all branches of the film industry are under constant upward pressure. The pursuit of this improvement cannot help but improve the appeal of our product, which is, after all, pretty unsubstantial. We are dealing with colored shadows—selling them for money—to people willing to pay for the illusion we present through projected images. The closer these images approach the quality of the normal visual experience, the more engrossing, convincing and satisfying they will be to the audience and, thus, the more worth doing again.

The achievement of this "Satisfying Visual Experience" involves the entire chain of components in the picture-taking and delivery system, and is no better than its weakest link. This chain has many links, each of which must be considered carefully for its effect on the final, projected picture. Some are not under the control of the film program buyer, but it is the job of the film producer to ride herd on every step of the process. In the film lecture field, the audience has the important advantage of having the producer right there, on the spot, next to the image he made. He stands or falls on the basis of this. There are the elements of the Roman Circus in such a performance. It is the nearest thing to live theater in the film business, and because of this, the film lecture business is likely to be around for a long time, even with plenty of canned shows available to the same public.

The quality of the image on your screen depends on these elements:

1. The raw film
2. The camera lens
3. The adjustment of the camera lens
4. The mechanical condition of the camera
5. The photographer's skill and technique
6. The processing of the film
7. The editing of the film
8. The handling of the film
9. The mechanical condition of the projector
10. The adequacy of projected illumination on the screen
11. The quality of the projector lens
12. The focus of the projected image on the screen
13. The eye of the audience

Chain Links 1-8 are the responsibility of the producer of the film. Link 8 overlaps the responsibility area of the producer and the film presenter or sponsor, who is in charge of Links 9-12, with, often, the concerned help of the film's producer. About Link 13, the best we can do is compensate for its deficiences.

In a monograph as brief as this, I can only suggest several areas where deficiencies may affect final image quality. Some will be obvious, others are part of the accumulated experience of 35 years in the illustrated lecture field, during several of which I was based in Hollywood, working on major studio camera crews, in optical printer technology, and later in the design and manufacture of optical test equipment used by most of the movie and TV studios around the world.

Before I take up the Chain Links individually, I need to explain the concepts basic to comprehension of the limits to which we are now able to work. Film manufacturing technology has shown steady progress in recent years, so that current camera and print film make it now mathematically possible to project an adequate picture from 16mm onto a screen 30 feet wide, and have the picture so sharp and bright that it gives a nearly perfect illusion of reality to spectators seated as close as 40 feet from the screen. By "mathematically possible" I mean that an image of such a size seen from such a distance would have detail finer than the eye could perceive, the contrast would duplicate normal contrast of scenes in nature, and the image would be steady enough so the viewer would not be able to perceive spurious mechan-

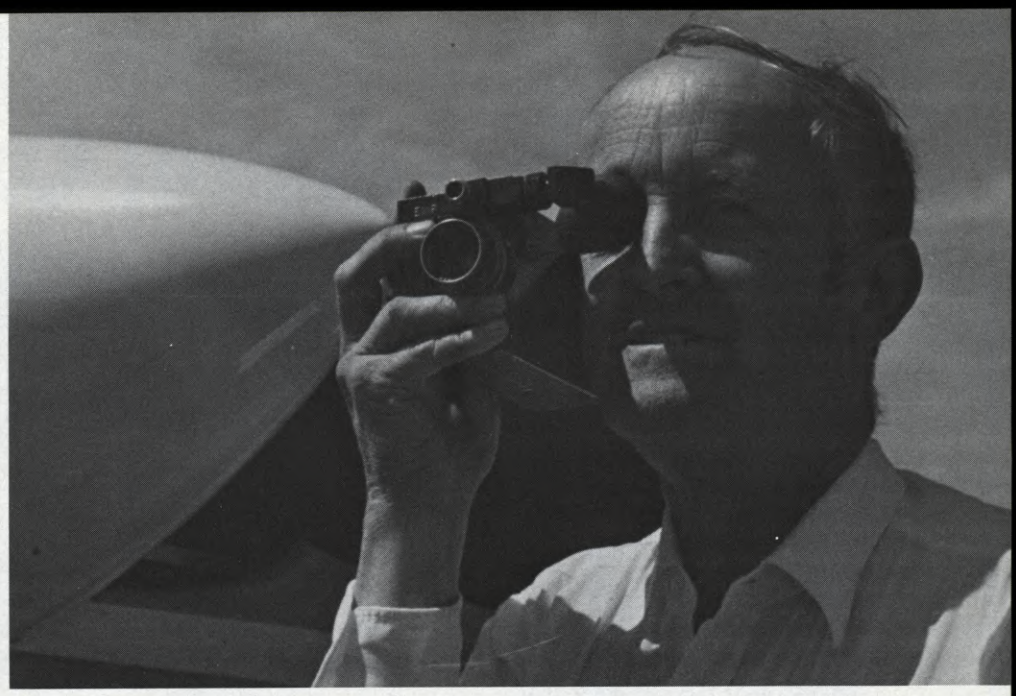
(LEFT) Sign at Seattle Center announcing Ken Richter's Opera House performances of his travel lecture presentation "TREASURES OF ITALY". (RIGHT) An "SRO" crowd of 3,160 people packs the Seattle Opera House for showing of "TREASURES OF ITALY". The program had to be repeated four times in order to accommodate all those who wished to view the performance. A veteran of the travel film-lecture circuit for many years, Richter has built a vast, loyal audience.

ical motion (jiggle or unsteadiness) in the image.

Since I will be referring to numbers to define the limits of the technical capabilities of the components of the chain, I should start by pointing out that the human eye, in good condition, can discern as two discrete bits, two lines separated by something more than one minute of arc, one sixtieth of a degree, which is one thirtieth the width of the full moon. In down-to-earth language, this means that if you hold an 8x10-inch picture at normal viewing distance, about 12 inches from your nose, for this picture to be as sharp as the eye can see, it must have image information nearly as fine as one minute of arc, which at 12 inches is approximately 1/300 of an inch. Of course it takes two elements to make a piece of image information. The little spot or line must have something to be in contrast with to be perceptible. So in an inch width of a picture viewed at 12 inches distance, if you had 150 black lines evenly spaced on a white background it would look gray. Your eye could not quite resolve the lines. However, when you have wider lines the eye can begin to make out separate lines. It is this limit of discernibility of individual pieces or bits of image information that determines Resolving Power, a concept which is basic to this entire discussion. If what we put on the screen equals or exceeds the resolving power of the human eye we have a sharp picture. If not, the audience does not have a satisfactory visual experience, and they complain "The picture wasn't clear", by which they mean, without knowing exactly why, that the picture did not duplicate normal vision as they are accustomed to seeing things, and as a result, they were vaguely uncomfortable and disturbed. Their illusion was impaired.

Taking our 8x10-inch picture viewed from 12 inches as an example: if we have about 120 bits of image information for each inch of width of the picture, such an image will be just about satisfactorily sharp for the average eye. (Resolving Power is conveniently discussed in lines-per-inch or lines-per-millimeter—a line is an adjacent pair of equal-width black and white lines, equivalent to the bit of information described above). So for our ten-inch-wide 8x10 picture, viewed from 12 inches, if we have 120 lines or bits per inch, or 1200 bits across the ten-inch width of the picture, it will be satisfactorily sharp.

If we have an 8x10 foot picture and view it from 12 feet, as long as we have 1200 bits the width of the screen, it is still a satisfactorily sharp picture, since each bit of the picture will subtend the same angle—that is, it will have the same apparent size as in the smaller picture seen at closer range.



Ken Richter, shown with his EMP camera, the world's smallest professional 16mm motion picture camera. Weighing only 1.2 kilos loaded (including battery), it is smaller than most Super-8 cameras, yet includes crystal sync and several other ultra-sophisticated features. Its "amateur" size and appearance make it acceptable in sensitive areas where larger equipment might be resented.

In fact, if you were at the World's Fair in Osaka, and saw their tremendous 80x100-foot picture, you might have been suitably overwhelmed until you noted that the audience got no closer than 120 feet from the screen. So what they saw was the same apparent size of picture as holding that 8x10-inch group portrait at a foot away. All they needed in Osaka was to deliver 1200 image bits the width of their 100-foot screen and they had you thinking that this was a technical breakthrough in sharpness, when, in fact, the 16mm medium has as good or better sharpness capability, if not yet the same maximum screen size potential. Since the 16mm image is only 1/5 the area of a 35mm movie frame, the whole 16mm procedure must be handled five times as carefully to get results comparable to 35mm theatrical films. It can be done, and is in fact being done on a routine basis on my lecture tours, where we are often complimented on image quality by knowledgeable photo enthusiasts in the audience. But I have no monopoly on the technology. 16mm films are more and more being blown up to 35mm for theatrical release, and more and more new theaters—the Cinema I, II, III type—are equipping with 16mm projectors only.

Quality in any product is invariably a direct reflection of the care expended on its manufacture. Our 16mm field is an outstanding exemplar of this. It starts with:

1. The raw film: Several manufacturers have tried, but at the moment, only the Eastman Kodak Co. has succeeded, in furnishing repetitively reliable film and print stock with resolution superior to the minimum requirement and color balance adjusted to the taste of the U.S. and Canadian audience. Europeans prefer, possibly because of even fewer crystal-clear, high-contrast days than we experience, to have their color films more muted, more pastel than ours. So European film stocks have not made much of a dent in the U.S. market, and virtually none in the illustrated lecture field. An American viewer tends to find European color "mushy"—not brilliantly "clear".

The actual usable width of the picture on 16mm film is just over 10mm, about 2/5 of an inch. To get that 1200 bits of image information spread the width of our screen, we have to get at least that many bits, preferably more, on the original film. 1200 bits on a 10mm-wide image means at least 120 bits or lines per millimeter resolution—three thousand per inch—1/10 the thickness of newsprint! This imposes stringencies all along the chain.

Fortunately, within the last few years, the film stocks have improved, and Ektachrome Commercial type 7252 will actually record 140 lines per millimeter, or 1400 bits the width of the 16mm frame—more than enough for our "Satisfactory Visual Experience" if we can deliver all or most of this to the screen. A good print on Kodachrome release print stock (Type 7387) will not degrade this resolution much, so the picture that goes on the projector, if carefully made, is no longer limited by the film and print stock as far as delivering enough resolution is concerned. We can now get a print with 120 lines per millimeter at least, so our

Continued on Page 986

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AN AMERICAN FILM INSTITUTE SEMINAR WITH GORDON WILLIS, ASC

A brilliant, often controversial cinematographer shares his considerable expertise with student filmmakers of the A.F.I.

PART II

What follows is the concluding segment of a seminar sponsored by the American Film Institute (West) for Fellows of its Center for Advanced Film Studies.

The seminar, moderated by Howard Schwartz, ASC, featured cinematographer Gordon Willis, ASC, and was preceded by a screening of "THE GODFATHER: PART II", on which he functioned as Director of Photography.

QUESTION: Do you have any opinions as to whether you're more effective with limitations or freedom?

WILLIS: That's a good question. I have friends who are actors and some of them become confused in making movies because they're undisciplined. In my opinion, you have a lot of freedom in the movies if you work within the limitations; then you're free. But I think that you do work better with a certain amount of limitation. There are some things you can't do if you're too limited, but the essence of good movie-making is discipline. There is nothing more horrifying than an undisciplined filmmaker. Things don't just happen; you've got to make them happen. So, yes, I would say that you do function better in a limited environment, because you're going to use a lot more skill and a lot more brain power to make it happen. In fact, I've probably done some of my best work photographically in a bad situation. I wouldn't want to shoot my way out of it again, or even get involved in it, but you learn a lot. If you have everything at your disposal, it can get raunchy. Like having too much time to rehearse, or having too much of this, or too much of that. You've got to face up to the fact that eventually you've got to shoot, and this is it. What I said about actors—any good actor who works in movies for any length of time realizes that he's going to get the best of himself or herself on the screen by working within the structure of the frame. He can act in the corner, and he can act between his legs, and he can act anywhere, but if he's not acting relative to what you're all there for—which is the camera—he's wasting his time. Good motion picture actors understand that limitation and know how to act within it, as do directors and cameramen. You learn to work within limitations. You are limited. It's true.

QUESTION: Do actors ask you what the framing is so that they'll know the limitations?

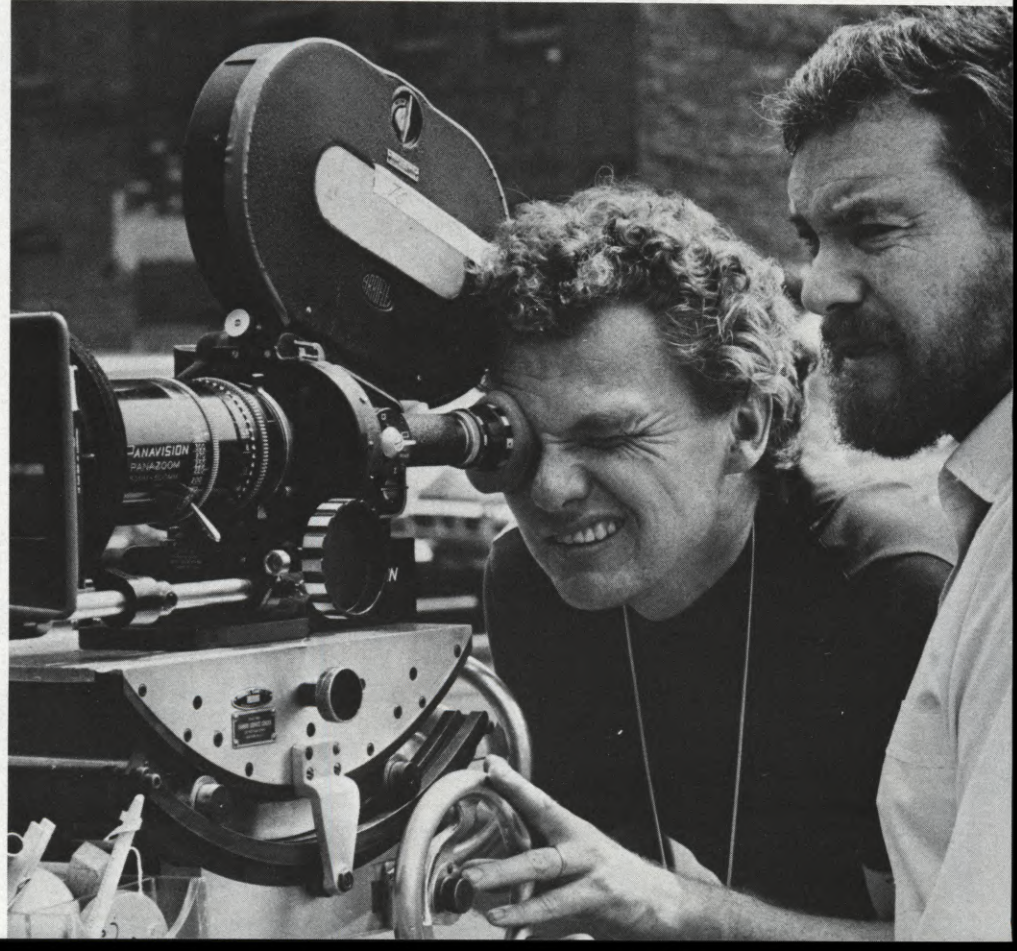
WILLIS: Yes. They want to know where they are in respect to the frame. Brando was very heavy with that, because he would never destroy himself in a performance if you were a mile-and-a-half away. At that distance, it's a physical performance, a body thing, not an acting thing. So he saves himself until he gets to the closeups. It's the same with any good acting in the movies, and good directors don't burn actors out in long shots. Acting in a long shot is a purely physical thing. You get it out of the way and then continue on to something else.

QUESTION: You mentioned the fact that as you and Francis Coppola worked more together, you communicated better and the need for dialogue between the two of you became less and less. What about your communication with the people on your crew? Do you keep the same operator, the same gaffer?

WILLIS: I've used several operators. I had one operator who did six pictures with me and then it was time for him to go on and start shooting his own pictures. So the answer to your question is, yes, I like to keep the same people, especially gaffers and grips. Grips take a terrible beating on shows that I shoot, much more so than electricians, because they have a lot more to do. But I do like to keep the same people, for the reason that I don't have to say as much to them. They already know. I'm exhausted at the end of a movie. I mean, it's a campaign for me, even though I enjoy it. Mostly my head is always going on a concept level, not simply a photographic level. As I said, photography comes out of a concept. If I get hung up on a set, it's because the concept is no good. There's no direction. We don't know which way we're going.

QUESTION: Speaking of concept in terms of photography, I noticed in "PARALLAX VIEW" that the photography really seemed to change when Warren Beatty became involved with the Parallax Corporation. The shots

Director of Photography Gordon Willis, ASC, behind the camera. At right is director Alan Pakula for whom he photographed "PARALLAX VIEW" and "ALL THE PRESIDENT'S MEN". Because of his sometimes unconventional approaches to cinematography, Willis says, "There are some directors who wouldn't touch me with a 10-foot pole. But there are others I work with and have a wonderful time with."



seemed to change compositionally; they took on a different look. Was that something that was planned, or did it come out of the locations?

WILLIS: For the most part, such things are planned. It's like picking focal lengths to shoot with. There are a lot of machine-gun shooters in the business right now, which is a shame. They just arbitrarily cut closeups with a zoom lens. For example, let's suppose I shoot a closeup of an actor at 150mm. Then I turn around to shoot the matching closeup of another actor, only to find that, because of the physical limits of the location, I can't get far enough away to shoot him at 150mm. I end up shooting his closeup at 50mm—and you're forced to that occasionally—but I'll do anything to avoid it, because when you cut those two closeups together the backgrounds won't match, the perspectives won't match, and the feeling won't be the same.

QUESTION: Do you have a more difficult time working with directors because you do have very strong opinions, rather than simply saying, "I'm going to photograph the film."? Does that make it kind of harder in a way?

WILLIS: I never have a difficult time working with directors. You always try to look for people that you know you can get along with. It's like choosing the girl you marry. There are some directors who wouldn't touch me with a ten-foot pole. But there are others that I work with and have a wonderful time with. Directors have a difficult time shooting a movie. It's a horrendous experience. They're getting beaten to death by the company; they're getting beaten to death by actors who don't want to cooperate; they're getting beaten to death by everyone. The mere fact that a director stays on his feet for eight or ten weeks, or sometimes many months, is a miracle. So I'm a director's cameraman. I would not take a job via a producer, because I feel that when you make a movie, you've got to have a united front. Aesthetically, physically, you're taking on a whole group of people. I don't get along with all directors, but that's a personality thing that everybody has to cope with.

QUESTION: Speaking of that, would you like to get into directing?

WILLIS: Not really. I'm actually better as an improver; that's what I am. I'm better at working out concepts with directors. With me a director can feel very secure if he has an idea about a movie, because when he's tired, I haven't forgotten the idea. And when I'm tired, I expect the same thing from him.

QUESTION: In that same direction, could you talk a little more about what you expect from a director?

WILLIS: I have to know from him what it is we're doing with the movie—what is the basis of the movie. This comes out of philosophical discussions and it's the most important part, in my opinion. I never walk into a room and ask him, "How do you want me to light this room?" You can light it 50 different ways, depending on what it is you have to accomplish. So what's important to me, that has to come from the director, is: "What is the movie about? What is it you want to say, and how do you feel like saying it?" Then it boils down to: "How do we handle these things?" After that, you go out and start doing it and that goes on from day to day. But once you have the philosophy of the movie set, you're no longer vulnerable. Your working decisions can be made from day to day, minute to minute, because you know what it is you're trying to do, or what you're trying to say. Sometimes the script's being turned upside-down and nobody is really sure what it is they're trying to do—what the scene's about, what the picture's about. But it's very easy to set a camera when you know what it is you're trying to do. It goes all the way from the philosophy to where you're standing at the finder and you've got to put down the shot. But it's based on the philosophy.

QUESTION: Do you think such discussions help to avoid the question of who's picking the set-up?

WILLIS: Yes, because you're working together. Some directors like to lay out shots. Other directors give you the shot. It depends on who you're working with.

QUESTION: In reference to that, could you explain how you worked with Coppola in blocking out each shot for "GODFATHER II"?

WILLIS: Well, it was much easier the second time, because we had become nicer to each other. But, especially at the beginning of shooting, Francis would spend a great deal of time laying out the way he wanted sequences to play. And he had very definite ideas about how they should be structured. So you'd end up with ten cuts in a sequence that you'd know about in advance. He'd lay them out and we'd go over them together. When things are thought out that well, they go much more smoothly.

SCHWARTZ: It's great that Coppola could give you ten cuts from the beginning of a sequence. It's beautiful when a director can do that, because then you can plan your lighting so that you don't trap yourself. That's the problem with directors who can only tell you about one shot at a time. You establish lighting, and now what do you do on the next cut? It's in the way and you've really got problems. Now you've got to hang lights from trapezes and do all sorts of other things to match your breaks. It's a luxury when a director can give you ten shots in advance.

WILLIS: If he gives you the set-up and tells you what he's going to do, it's terrific.

QUESTION: When he blocks things out for the set-up, does he include camera moves at specific points? In other words, does he do that or do you do it?

WILLIS: Sometimes it's him, sometimes it's me, sometimes we work it out together. It all depends.

QUESTION: But he has a strong idea to begin with?

WILLIS: Oh, sure. Sometimes you don't have any strong ideas. I mean, you have the philosophy, but you have to sort of develop the structure as you go along. You can tell when a director's having problems. He stays too long in the corner with the coffee. If he gives you ten shots as I said, and you get through two of them, and then he's too long in the corner with the coffee, you realize you're about to make another five cuts, or maybe you're adding one, because it's not working. If a director's a good cutter, he can see it coming—which is great, because I hate to see it coming at the end of the day when there's no way to solve it, generally, except to start over.

QUESTION: When a director lays out the ten shots for you, I take it that those are specific shots and it's not sort of "Okay, let's cover the scene."

WILLIS: It ranges from specific shots to "Let's cover the scene." But if you know a director well, you know what he means when he says, "This is what I'm going to do here: I get a shot of him, I get a shot of her, and I get a shot of the cat." He doesn't have to draw a picture beyond that, because you know the story and

Continued on Page 994

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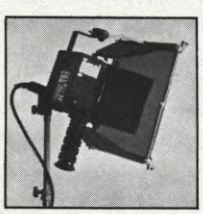

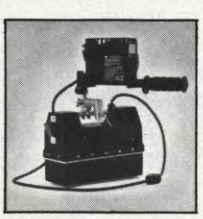

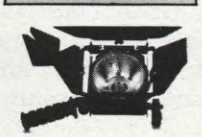

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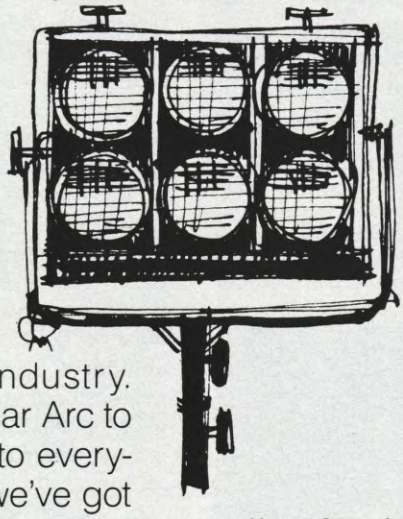

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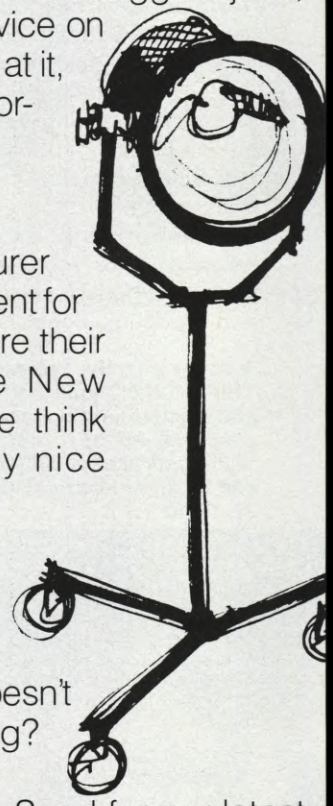

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INDUSTRY ACTIVITIES

PMPEA SEMINAR WILL FEATURE SPECIAL EFFECTS WIZARD DOUG TRUMBULL

Every year the Professional Motion Picture Equipment Association (PMPEA) conducts a seminar in conjunction with the annual SMPTE Conference. This year the PMPEA and co-sponsor Eastman Kodak will present a very special program. The guest artist is special effects wizard Doug Trumbull. Trumbull is the undisputed king of special effects, having dazzled audiences with his visual magic in "2001: A SPACE ODYSSEY", "THE ANDROMEDA STRAIN", his own "SILENT RUNNING" and most recently the acclaimed "CLOSE ENCOUNTERS OF THE THIRD KIND".

Trumbull's presentation will include examples of his most recent visual creations, as well as some behind-the-scenes demonstrations of his technique. The PMPEA seminar will be held in the Ziegfeld theatre, 141 W. 54th St., New York City (near 6th Ave.) on Monday night, October 30, 1978 at 6:15 p.m. The Ziegfeld is one of the most modern, well equipped theatres in New York, thus assuring the highest quality projection of Trumbull's visual effects, including examples in 70mm and 6-track sound.

Trumbull will explain his new techniques for motor-driven traveling mattes, extensive multiple exposures, and computer controls that can store and recover precise shots. His innovations also include a new "motion control system" consisting of a digital electronic camera control system providing automatic and repeatable camera movements including pan, tilt and dolly.

This is sure to be the most dazzling, as well as the most informative, seminar the PMPEA has held. Tickets will be sold at the door and in the SMPTE Conference lobby at the Americana on Sunday and Monday. However, because the program may be sold-out it is recommended that tickets be purchased in advance by sending $5.00 and a stamped self addressed envelope to: PMPEA; University Tower, Suite 809; 6440 Central Expressway; Dallas, TX 75206.

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SMPTE SPECIAL COMMENDATION AWARDS

William D. Hedden, President of the Society of Motion Picture and Television Engineers, has announced a number of distinguished commendation awards to be presented during the Society's 120th Conference at the Americana Hotel, New York, Monday, October 30. Those receiving the Special Commendation Awards will be:

Julius Barnathan, President, Broadcast Operations and Engineering, American Broadcasting Co., for contributing in outstanding fashion to engineering progress in all phases of television—broadcasting, research, design of equipment and facilities. He is particularly noted for his leadership in developing new technologies and his willingness to share his knowledge through lectures and public appearances.

Dr. Georges Broussard, Director of Research, Thomson-CSF, for having pioneered the development of the videodisc system since 1969. His energy and enthusiasm in persuading people in production and applications of the importance of the videodisc concept have made possible its industrial development.

Linwood G. Dunn, ASC, President, Film Effects of Hollywood, for his innovations in the creation of special optical effects in motion picture and television production. He has made outstanding contributions to the industry as a cinematographer, inventor of printing equipment, developer of new techniques and an executive.

David W. Samuelson, Director, Samuelson Film Service, Ltd., of England, in recognition of his lifelong achievements as cameraman and producer, filming, in over 40 countries, newsreels and documentaries covering aviation and motor sports and every type of news event including the coronation of Queen Elizabeth II. He is a past president of the British Kinematograph, Sound and Television Society.

The Awards will be presented at the Annual Awards Presentation following the Get-Together Luncheon that will open the Society's 120th Technical Conference at the Americana Hotel, New York City, October 29 to November 3. An Equipment Exhibit of professional motion-picture and television products of over 100 companies will be held in conjunction with the Conference.

A scene from the Columbia Pictures/EMI production of "CLOSE ENCOUNTERS OF THE THIRD KIND", showing the fabulous Mother Ship hovering over Devils Tower, Wyoming, and about to land at the secret Earth base. The intricately composited scene is the creation of special effects wizard Douglas Trumbull, who will present a spectacular demonstration of his work at a special seminar sponsored by the Professional Motion Picture Association and Eastman Kodak, to be held at New York's Ziegfield Theater on the evening of October 30, 1978.

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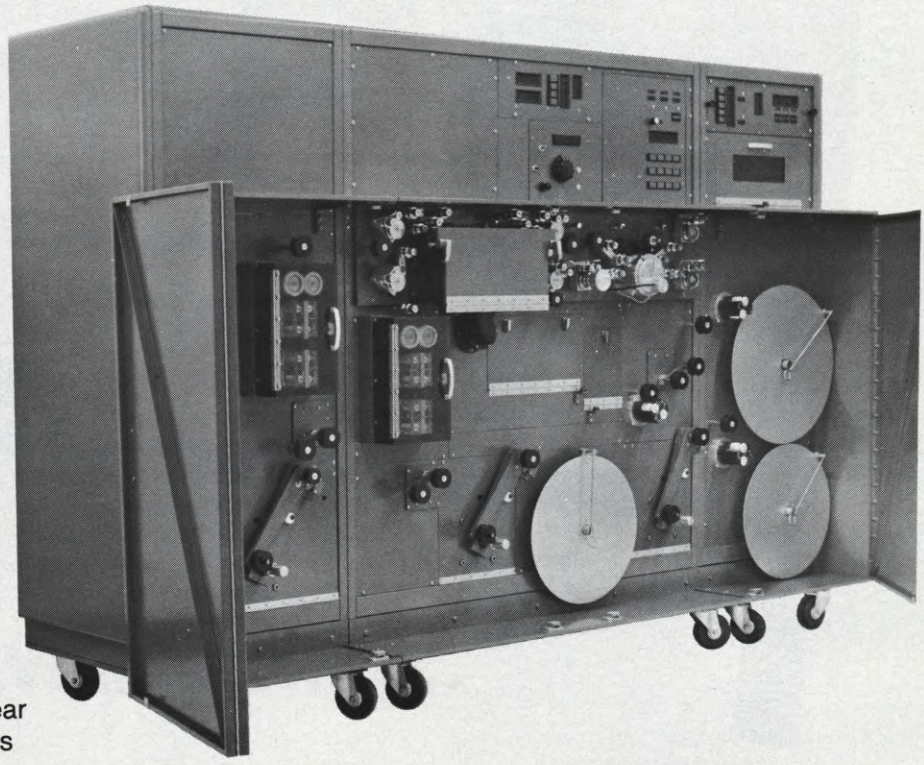

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MORE TO "CLEAR PICTURES" THAN MEETS THE EYE

Continued from Page 975

1200 bits the width of the image criterion is maintained.

Older film stocks did not have this resolution. Kodachrome I had 55 lines earlier and 80 lines more recently. A print is always slightly less sharp than the original film from which it is printed; so, often in the earlier days, a print from Kodachrome would have only 40 lines per millimeter—giving only 400 bits the width of the screen. As a result, the audience could not sit up close. Unsharp film and often unsharp projection lenses would make it an uncomfortable experience for the audience. In those days, the first people to come to the show would sit in the back of the hall, driven there by the arithmetic.

If it takes 1200 bits the width of the screen to give an image sharp enough to be viewed from the diagonal of the screen (by screen diagonal is meant the distance from one corner of a picture to its diagonally opposite corner. This is, in any picture of any size, the usual minimum viewing distance.), a picture with only 400 bits could not appear sharp until the audience was at least three times the diagonal of the image away. (Television has only 200 bits the width of the screen, which explains why it hardly pays to have a big screen TV set. To have comfortable viewing you have to sit six times the diagonal from the TV screen. The medium cannot, by its electronic limitations, transmit fine detail. A modern 16mm picture will have about 50 times as much image information as a TV picture.)

This limitation of image information recording capability on the earlier film stocks is a reason why an older film is easily identifiable. It is simply not as sharp as a newer production, even when made by the same equipment. Mainly for this reason, I have withdrawn my earlier films from my repertory, although they are still useful and adequately sharp for television.

2. The camera lens: The more we learn about optics, the more we marvel at the design and manufacturing genius that has produced the current generation of lenses for 16mm filming. Earlier lenses were adequate for the resolution of the films of the day, but only top quality, modern, generally shockingly expensive lenses will deliver images as sharp as contemporary film can record. Obviously, a lens capable of 80 lines per millimeter maximum resolution would give a fine picture on some of the earlier camera stocks, judged by the standards of the times; but it would simply be inadequate on today's film capable of resolving nearly twice that. So, many filmmakers have discovered to their dismay, that their lovely, handy, expensive zoom lenses computed to resolve a maximum of 80 lines per millimeter, just won't hack it with the new film stocks. Many a shot that "is not clear" can be traced to the use of a lens now technologically obsolescent, which includes the majority of zoom lenses even now on the market. A zoom lens, while a great convenience for newsreel-type filming, has by the necessity of incorporating as many as 27 glass elements, been the product of inevitable design compromises. Some of the compromises trade overall sharpness, and especially contrast, for zoom capability. Contrast is an important component of image quality, so much so that a low-contrast, high-resolution image is less satisfactory to the viewer than a high-contrast, low-resolution image. Proper contrast comes from clean lenses and filters shooting subjects with adequate contrast (overcast day footage, being less contrasty, appears less sharp), and projected via clean lenses. A complicated lens, with more glass-air surfaces, each of which reflects a small percentage of the light striking it, will inevitably have more scattered, non-image-forming light splattered through the system, and the resulting image will have reduced contrast and thus suffer a reduction of apparent sharpness.

3. Adjustment of the camera lens: Even the best lens in the world won't give much of a picture if it is ½ inch out of focus on the camera. Even 1/1000 of an inch focussing accuracy, formerly considered adequate for the usual 1/1000 of an inch "circle of confusion" (or blurred image of a point of light) is now a serious maladjustment. That old 1/1000 of an inch allowable "circle of confusion" on which depth of focus scales are calculated is obsolete. 1/1000 of an inch is 1/40 of a millimeter. We are now dealing with a system, film and lenses, nearly four times this sharp. So the adjustment of the lens on the camera must now be in the order of 1/5000 of an inch.

There is only one practical instrument to focus a camera lens on running movie film to this order of accuracy: an autocollimator; which explains why I found myself designing and making my own, back in 1949, in preparation for a forseeably rough ride across the Sahara, in which I knew the cameras and lenses would get banged around. Had it not been for that prototype collimator, I am sure we would have had mostly out-of-focus film and thus no revenue from the trip. There are now several makes of camera autocollimators on the market. Through no coincidence whatsoever, I feel that the autocollimators made by Richter Cine Equipment, Essex, New York, 12936, are the best and most versatile available. They also happen to be the least expensive. With one of these autocollimators, and its comprehensive instruction manual, a photographer can select the best from a number of similar lenses for resolution beyond the capabilities of present film stocks, and for contrast, color correction, astigmatism, coma, and all the other ills to which optics are heir. Then he can adjust the lens to focus precisely on the film as it is actually running through the camera. He can be sure the viewing screen is at the same distance from the lens as the film plane. He can see if the focusing scale is correctly established. He can see if his filters are as good as his lenses; or if, and how much, they impair the quality of the image—all right there on film. He can observe the deterioration in image sharpness and the shift of focal plane caused by putting a convenient gelatin filter between the lens and the film. (This is bad medicine. Spherical aberration is introduced, and parts of the image plane come forward, as much as 2/1000 of an inch; enough to break the

Ken Richter appearing on George Pierrot's TV *"World Adventure"* show, telecast by WWJ-TV, Detroit. Pioneered by Burton Holmes in 1897, the film lecture business flourishes today, with more than 20,000 programs presented each year to live audiences estimated at 15,000,000.

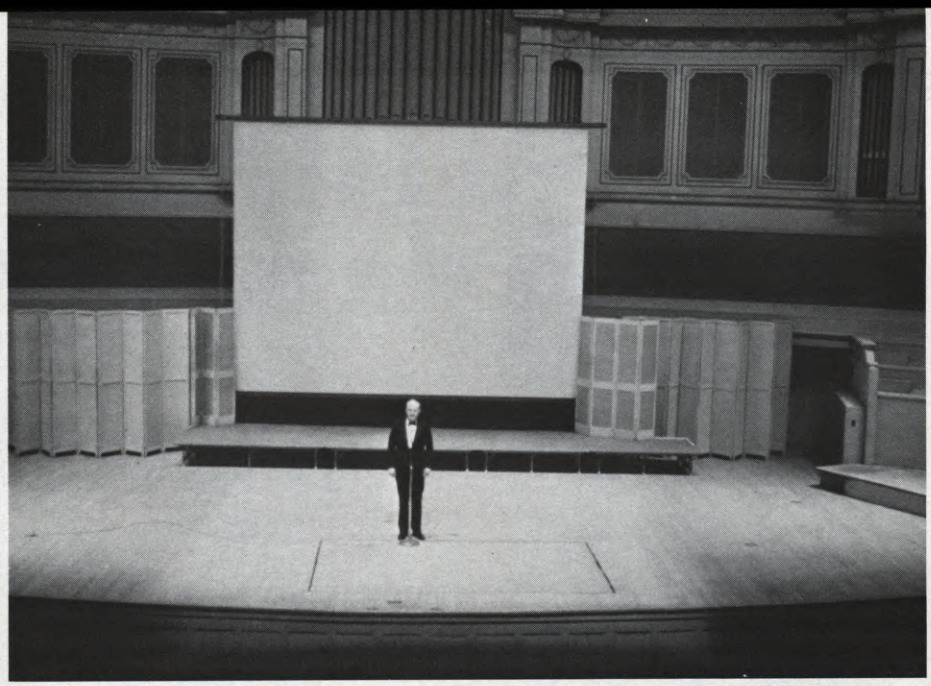
heart of anybody trying for an image as sharp as the equipment could have given.) And he can run through the traverse of his zoom lens and watch it as it goes in and out of focus as he zooms.

As you may observe, I am high on autocollimators. I would attribute my survival in the field to the use of this device. Whatever else is wrong with our film images, at least they were sharp when they left the projection booth.

4. Mechanical condition of the camera: One obvious source of problems is when things come loose: for example, a loose turret on a camera. Wiggle it, preferably in front of a collimator. Check lenses in mounts loosened by damage, wear, or vibration due to transportation. I have had internal lens elements unscrew themselves while being carried to Australia in a jet. Fortunately, timely use of the collimator caught this before film was wasted.

Have a look, through your collimator, naturally, at the quality of the focal plane in your camera. If, when you are looking at a good lens, the focal plane seems to jump back and forth, your camera is afflicted with "breathing". Obviously, if the film flaps about in the focal plane, even the best lens will have a hard time planting an image on it. The designers of camera have had the design dilemma that came from the fact that film was likely to be scratched by contact with hard surfaces. So, many cameras, like the Cine Special and the Arriflex, avoid scratch risk by minimizing metal contact with the film. Unfortunately, this means that the film is not touching metal at the moment it is being exposed—it is unsupported, hanging in space like a plastic curtain, and subject to the dynamic disturbances of being yanked 24 times a second. This is particularly apparent viewed in the collimator, and explains why I have made my own full-support pressure plate for my Arriflexes, and have confected a fix with a small ball bearing in the center of the Cine Special pressure plate. I prefer the comparatively minor risk of scratch from metal contact (keep the camera clean—vacuum clean it before starting a show, and keep after it) to the demonstrable certainty of impaired sharpness due to lack of support for the film during exposure.

A worn, defective or poorly designed camera mechanism can fail to repeat the accurate positioning of the successive frames of film. The result is a picture that is not steady on the screen. Hand-held cameras often enable a photographer to get exciting action shots where a tripod would be an impossible encumbrance, but a film made entirely with a jiggling, weaving hand-held camera will be uncomfortable to view and will reveal the fact that the cameraman was either in too much of a hurry or too lazy to use a tripod for scenic shots, where the effect of a finely detailed landscape is destroyed by spurious camera movement.



Ken Richter onstage at Chicago's Orchestra Hall introducing his film "O CANADA". Says Richter, "It's a solo act and, thus, cheaper than the Chicago Symphony, which uses the same stage." His large following appreciates not only his dry wit, but breathtaking photography characterized by ultimate sharpness on the screen.

5. The photographer's skill and technique: One of the glories of our field, as with any art form, is the diversity of styles and viewpoints. Yet, as in any other medium—music, sculpture, painting—talent unsupported by thorough technical grounding is likely to produce results that may occasionally be spectacular but are more likely to be, at best, spotty. Filmmaking is the most complicated art form ever created. No one ever makes the perfect film. If I do, I'll quit. Technique should be so good that it is invisible, not distracting the audience from savoring their visual experience. Sloppy camera work, coming from disdain for the work and time and dedication involved in becoming a competent photographer, will show on the screen. If a man has more important things to do than wait until there is a blue sky to give a blue reflection on the sickly grey waters of the Danube, he had better not advertise a ride on the Beautiful Blue Danube. Of course, he may not be able, at today's prices, to wait for a clear day. So if you get your picturesque boat trip shot under overcast, it means that economic pressures were on your photographer, and your picture "isn't clear". You generally get what you pay for in this field, as in most.

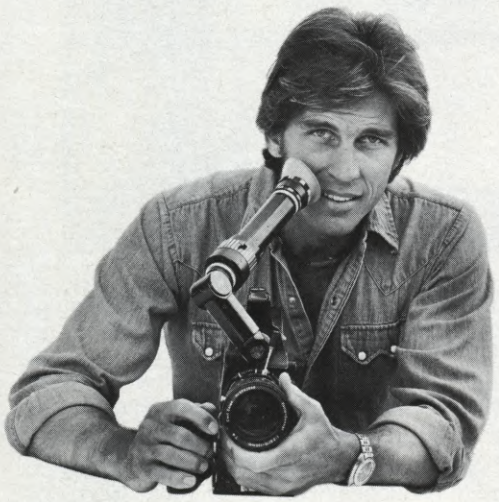
6. Processing the film: Some lucky photographers mail their shot 100-foot rolls home a few at a time, trusting to couldn't-care-less postal employees to keep their film below 105°F (above this, color film loses blue), away from X-rays, out of radioactivity and other things that can impair images. Most of us haul our film personally to the delivery room at the lab and send it in with a prayer. Then, if all goes well and the film doesn't get on a machine that stops in mid-career with a stuck yellow developer pump, a blown fuse, or an overactive bleach; and if it is not then lost in the mail or burned in a plane crash on its way home (all disasters from my personal experience), we edit the footage and send it to the printing lab for a timed, color-corrected print. Often this is done well, on the print stock specified. At other times, the lab may print it on a grainer, lower contrast stock that they can develop in their own warm bathtub rather than sending it to the nearest Eastman facility for the complicated processing required to develop a Kodachrome print. I have had up to four prints made of a lecture film to get one that meets my standards. But with a lecture print costing upward of $700, a lecturer may have to use what he can afford, even if it clearly isn't as good as he hoped.

Some speakers, men who challenge the Goddess of Luck every night, often because they can't afford a lecture print, project the original Kodachrome film—that is, the film that actually went through the camera. If it is damaged in the projector, they are destroyed, unless they have a print on Ektachrome. While Kodachrome II is a fine film, it is not intended as an original for duplication, except on a

Continued on Page 990

The Arriflex 16SR's helpful viewfinder:

They pay you to *see*. Here's an instrument that actively helps you to do that.



Whatever position you bend its finder to, the 16SR's image is always upright and correct left-to-right.

Three-way rotation

The finder swings over from one side of the camera to the other—190°. It also rotates 360° parallel to the camera's side. And it swivels 25° *out* from the camera's side.

Key to versatility: symmetrical design

On most reflex camera designs, the mirror/shutter is mounted to the right of the aperture and the finder to the left. On the 16SR, the mirror/shutter is below the aperture and the finder is above.

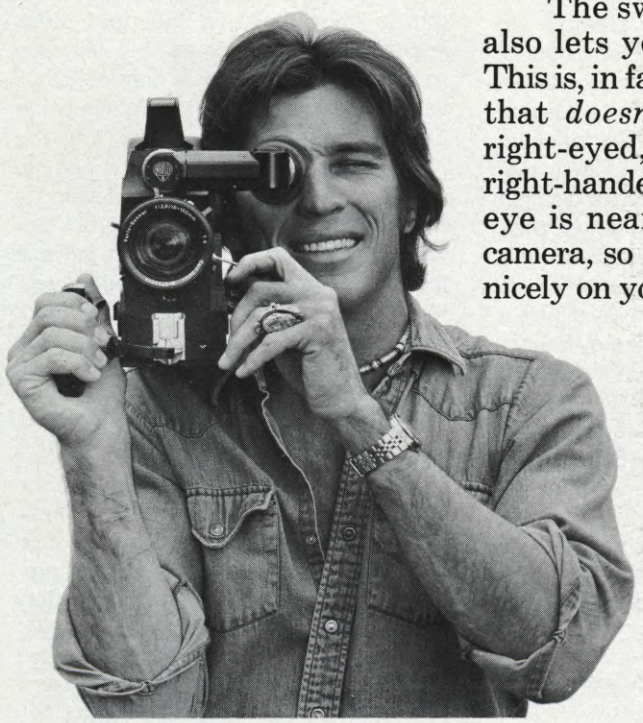
Ambidextrous

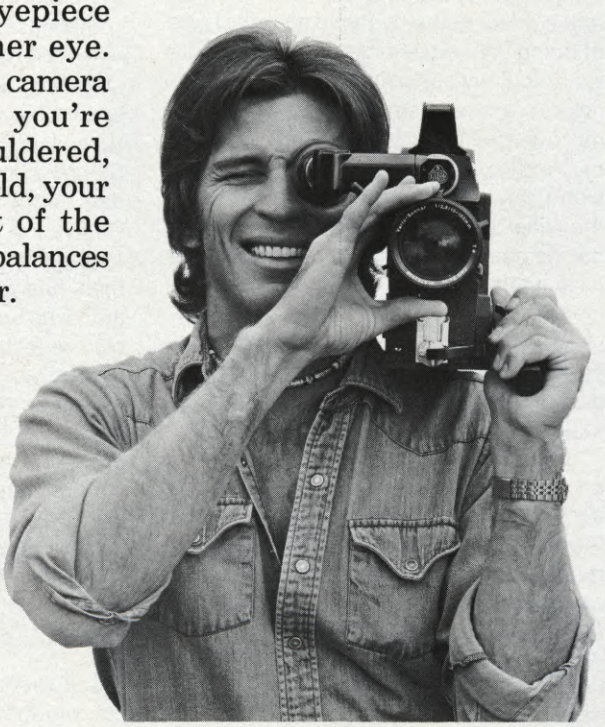
So the primary optical path is vertical, instead of horizontal. It doesn't favor the left side; it doesn't favor the right. And it's equally happy pointing straight up—or any angle in between.

Adaptable

The swivel-out eyepiece also lets you use either eye. This is, in fact, the first camera that *doesn't* assume you're right-eyed, right-shouldered, right-handed. Hand held, your eye is near the front of the camera, so its weight balances nicely on your shoulder.

The seven-inch finder extension makes high angles easier. So does the shutter, which always stops open to the 16SR's viewfinder.





Steal candid shots by looking the other way.

Fiber focus screen

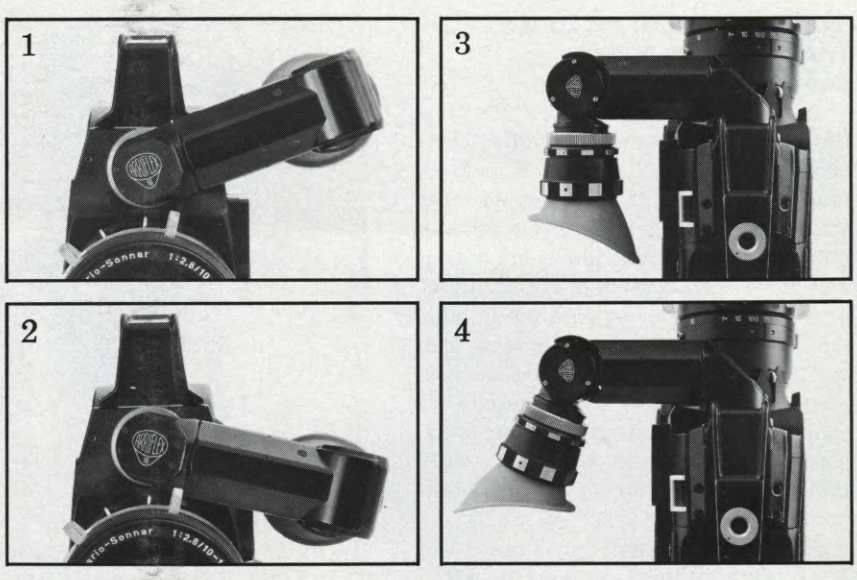
Compared with a groundglass, the 16SR's fiber screen transmits more light. Viewing is easier at low light levels. Edge-to-edge brightness is more even, too. And there's much less light scatter, and no groundglass grain. So image contrast is better and it's easier to see when you're stopped down.

Superspeed optics

To match the latest fast emulsions and fast lenses, the entire viewfinder system is a new, large-aperture design. The Zeiss lens transmits T1.3 to the film and the Arriflex finder transmits it to your eye.

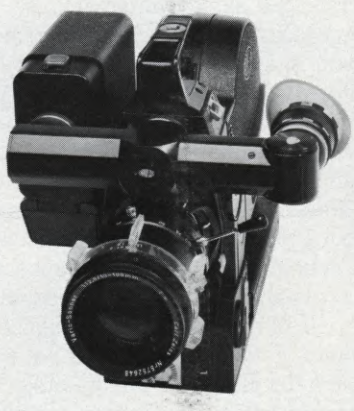
Big, bright image

Moreover, the eyepiece image is magnified twelve times. All in all, the 16SR has the brightest and the sharpest viewfinder image available in 16mm. *Helpful.*



Custom fit

With the 16SR resting on your shoulder, you can adjust the height of the eyepiece (photos 1 and 2); and you can move it away from the camera's side (either side), to suit either eye (photos 3 and 4).

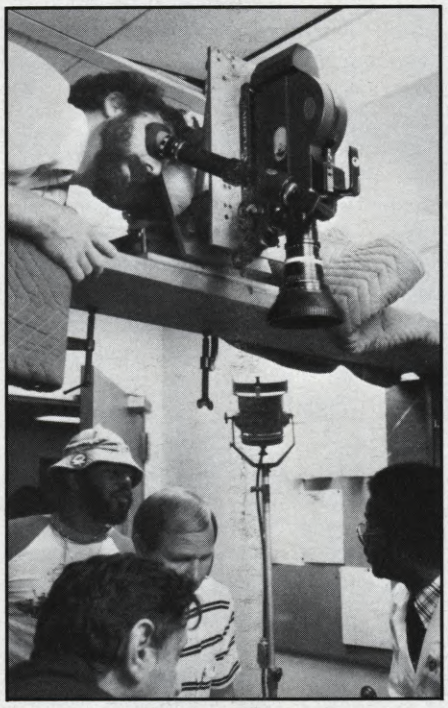


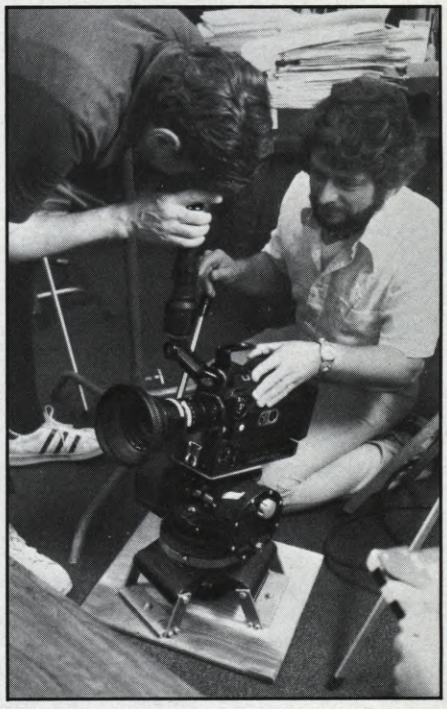
Video monitor

In the photo at left, you can see the Video Adapter mounted on the 16SR's right side. It's easy to attach. On the left side, you view the reflex image normally. The video pickup runs on 12VDC and 110VAC; and it works with most standard remote TV monitors or videotape recorders.

Faster setups

Wherever you put the camera, you can quickly see the shot — and so can the director.





16SR at work: left: Jack Cooperman; right: Jack Green. Photographs by Ron Grover.

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MORE TO "CLEAR PICTURES" THAN MEETS THE EYE

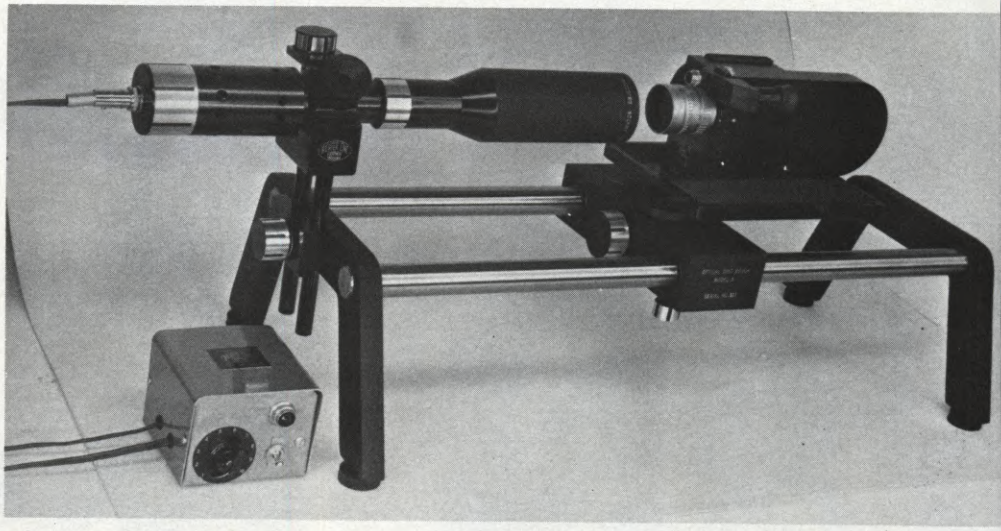
Continued from Page 987

low-contrast, somewhat grainy Ektachrome print stock. It has, as an original, resolution above 120 lines per millimeter, so it satisfies the information transfer criterion; and the color quality of the original, if well photographed, is beyond reproach. The risk of running the original film, with a splice for every scene, with one's entire equity in the production in jeopardy each time it is projected, is beyond the nervous capacity of most of us, for whom Eastman has mercifully provided an alternate system, with generally equal or better screen results.

Some of the faster film stocks, like 7242 Ektachrome, especially when "pushed" by the lab for extra sensitivity, making otherwise impossible scenes filmable, may show visible graininess and reduced resolution. This compromise can be elected by the photographer, who, however, should not be so unconscious of technique that he uses the fast, grainy, less sharp footage outdoors in sunlight, where it will show a conspicuous, unfavorable comparison with film designed for normal high light level photography.

7. Editing the film: It has been well said that a film is made on the editing table. An ingenious editor can take a film with technical faults in the photography and by so juxtaposing the scenes, have a visual continuity that makes sense, but also covers up technical difficulties. Who among us has not salvaged the odd bad but necessary shot by using it as a quick cut? There is even the ugly rumor that some speakers call on the projectionist to "touch up the focus" on shots they know in their heart or hearts weren't sharp to begin with, thus shifting the blame for pictures which "aren't clear".

8. Handling film: Once the original is edited and the print made, the quality of the image depends on how the print is maintained. Many producers have an emulsion-hardening-lubrication treatment performed on the new print. We have found that this reduces the risk of scratching and maintains the pliability of the film, although its effect on spliceability may be a minus. If film is overheated in a projector that delivers too much heat to the film gate it can be warped so that it will not lie flat in the gate of the next projector. Or it may become deformed by being allowed to lie in loose coils on the reel. For a proper projection lens to do its job, the film should lie in a predictable plane in the projector. Anything that deforms the film impairs the ability of the projection lens to deliver all the information from the film to the screen.



The R2 Autocollimator and optical bench, made and distributed by Richter Cine Equipment, Essex, N.Y., and used to test the author's camera and projection lenses, plus those available from his company. Shown here under test is the #3 prototype of the EMP 16mm camera.

The cure for film warped from overheating is a process performed by Permafilm of California, 137 N. La Brea Ave., Hollywood, California. To avoid the problem of warped front ends of films, I customarily carry my films tails up, so that the pressure of the outer windings will force the head end of the film to lie flat. I rewind before the show, sometimes several hours ahead of time with a possibility of review of film condition and splice intactitude; if the schedule does not allow that, the film is rewound in the projection booth and reel 1 has an hour and reel 2 has two hours to be coerced flat before it is shown. Films, the front ends of which once were hard to keep even approximately flat, and thus sharp, have responded well to this technique which takes the "plastic memory" of the film into account.

Film that gets dirty by being run onto the gritty floor of the average projection booth, or run through enthusiastically overoiled projectors, will pick up scratches, which ruin the illusion we are selling. If only the scratches would run horizontally! Then they would look like life, with power lines through every view.

9. The mechanical condition of the projector: Consider the demands made on a 16mm projector for auditorium use. It must take a picture less than half-an-inch wide, magnify it between 100,000 and 1,000,000 times its original area, switch images 130,000 times during a show, and do this without calling attention to itself due to mechanical deficiences. It is gratifying to see the improved general condition of projection equipment in the last few years, and the higher standards of maintenance that now prevail. Still, in too many places, the projector is regarded as a mere accessory rather than the prime instrument without which there would be no show. Many sponsors make sure there is an adequate standby projector available and ready to go. On the average we have experienced projector breakdown about once in every 100 shows—about the same mechanical endurance as flying a light plane 30,000 miles or driving a car 10,000 miles. Both require maintenance. A clean projector is less likely than one caked with oily dirt to damage film and stop the show. A simple projector is less likely than a complicated machine to damage film and stop the show. We have had such an unfortunate history of film damage on "Self-threading" projectors that we write it into our contract that they should not be used on our shows. The "self-shredder", as it is sometimes known, was designed to avoid the requirement for intelligence on the part of the projectionist. This is dangerous. There is no substitute for an intelligent projectionist, especially when things go wrong. He also can be sure to take the preventive maintenance steps well before the show that will avoid a potential mechanical interruption.

Trouble spots in projectors: Pulldown shuttle: After much use, the steel pulldown cam can wear, causing the picture to jiggle vertically, wiping out horizontal detail in the projected image. This is distracting and unrealistic. Cure: Projector to repair station.

Pulldown claw: After 100 hours of use, examine the bottoms of the pulldown claws to see if a groove is being worn into the steel by contact with the film perforations. Even steel will show erosion after a million hits on plastic, which is about the

figure for this much use. Cure: Replace pulldown claws when they cause picture jiggle. If the grooves get too deep, they can rip perforations and destroy the film.

Sideguides: The film is channelled through a slot of which one side is stationary, and the other has a spring to hold the film by its edge. If the spring side is dirty so that the spring-loaded guide sticks, the film will wander from side to side in the channel and the picture will weave on the screen. Cure: Clean the sideguides with a Q-tip and acetone. Check the other sideguide also. If it is choked with oily dirt, the film will not have a reliably repetitive positioning, and you will see the results on the screen as a wobbly picture.

Pressure plate: This holds the film in the film channel. It is one of the major sources of scratches. Frequent culprit: bits of tape from ends of reels. The pressure plate is mounted on springs and should move freely fore and aft. If it is stuck, it will not make the film lie in its channel, so it may be impossible to project a good image. Cure: clean.

Shutter synchronization: The shutter covers the light source while the film is being moved from one frame to the next. It is possible for this thin metal blade to shift in relation to the shaft on which it is mounted. Result: Images like waterfalls in the worst case (this can also result from a lost film loop in the projection gate), or bright horizontal information in the projected picture bleeding down into adjacent darker areas, resulting in loss of contrast and horizontal resolution. Cure: repair station.

10. Adequacy of projected illumination on the screen: Eastman Kodak Co. says that their color film materials are balanced to give optimum results when projected at a level of 11 footcandles on a matte white screen. At illumination in excess of this amount, light coming through the shadow areas reduces the contrast of the image. At illumination levels substantially below the optimum, the bright parts of the picture are not as bright as they should be relative to the shadow areas, so the contrast is reduced. As mentioned earlier, the contrast of the image is a vital part of the viewing process, so a lower contrast image appears less sharp.

(To clarify what is meant by the measurements cited above, one footcandle is the amount of light that would fall on a surface one foot from a standard one-inch-diameter candle.)

Most modern screen materials have directed reflectance design, so that unlike a matte white screen, which reflects in all directions equally, the reflectance pattern of the screen—where it throws the light—can be matched to the hall. For example, a beaded screen reflects light almost directly back to the projector, like a Scotchlite sign. This is fine for long, narrow halls, but 15 degrees off the axis of such a screen, the picture is very dim, with low contrast—"not clear". However, along the axis of projection, the beaded screen returns three times as much light as a matte white screen, and is said, therefore, to have a "gain" of three, compared to a gain of one for the matte white screen. A typical theater screen needs to return most of the light to an audience distributed approximately in a flattened elliptical, football-shaped pattern as seen from the stage. Embossing a plastic sheet with tiny cylindrical indentations

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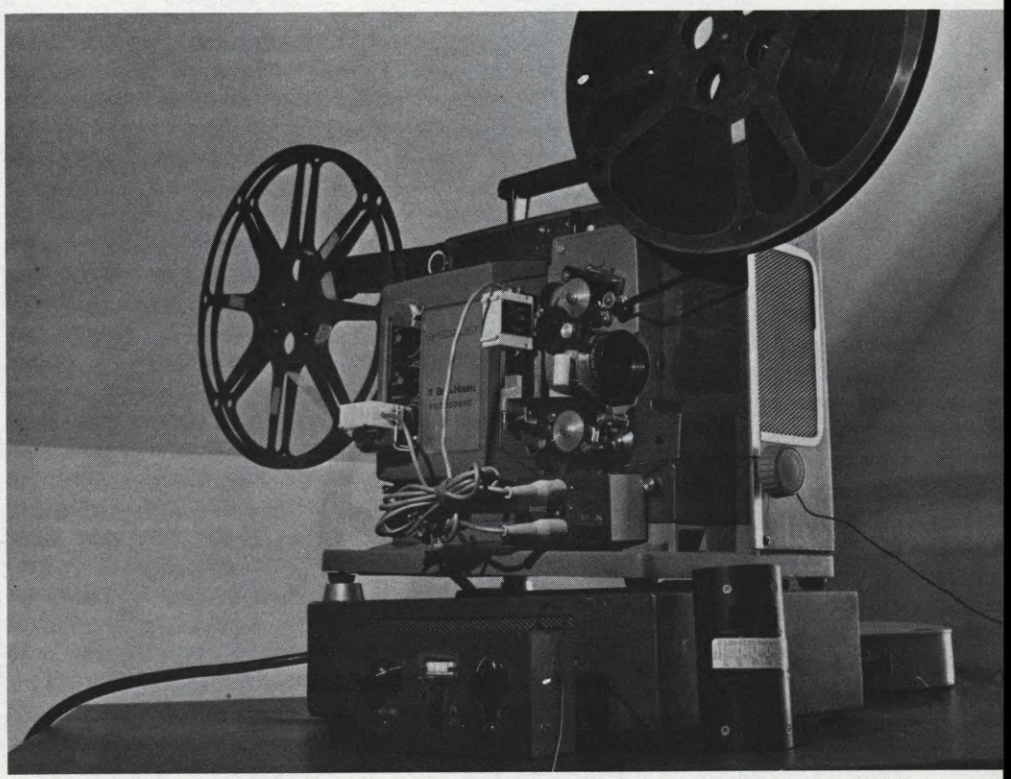
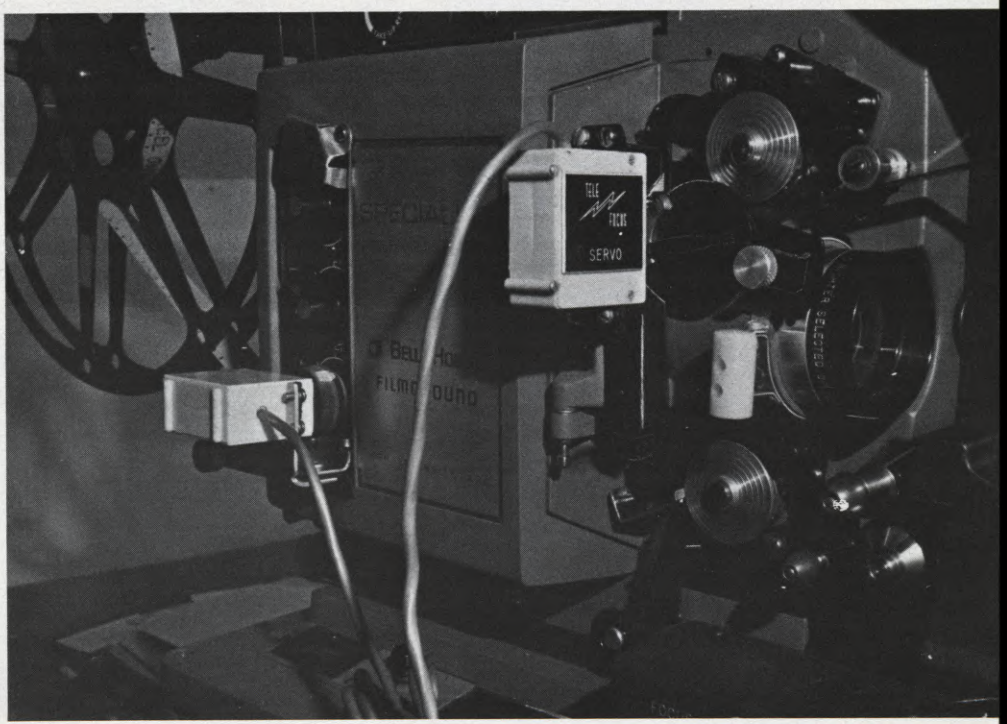


Set up for remote control by the film lecturer on stage, the Tele Focus radio controls for volume levels and lens focus are shown attached to Bell & Howell projector. Two-channel transmitter in foreground. Note also John Strong's light meter (cylinder) in front of the projector. (BELOW) A closer view of the remote radio controls on the projector. These give the lecturer total control over picture and sound quality, without relying on projectionist.



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you know it has to be done in a given way.

QUESTION: But when Jim Bridges was here, he talked about the fact that no matter where you put the camera, or what the shot was going to be, he would actually run the scene all the way through for the actors. It seems to me that in doing that, you're never really sure how you're going to cut the scene together.

WILLIS: You're talking about "THE PAPER CHASE"—which is a good movie, in my opinion. It's a simple movie, and I liked it. But what Jimmy was actually saying, I think, was that for the actor's benefit, for the sake of the performance, he was letting it go all the way through. Some actors need that, some don't. You may only be doing a closeup of one actor, and he may have only one or two lines, but you're playing the whole thing to get him up to where he's supposed to be.

QUESTION: Did I understand you to say that you took stills before "GODFATHER ONE" started in order to get your color right?

WILLIS: No, no. The very most I do is run a test for the laboratory just before I shoot simply to get the printing light. I don't do anything else.

QUESTION: But did you show this to Francis? Did he know what he was getting?

WILLIS: No, because on "GODFATHER ONE" he was having a lot of problems. He really didn't have time for that. I was very happy that the movie developed into what it did, because it was very difficult to shoot. It was hard for him because he was under attack.

QUESTION: Could you talk a little bit about the rhythm that takes place on a set when you're shooting that has to do with camera rehearsals, the time you need to light, and when you light, if it all unfolds ideally?

WILLIS: Well, the director gets the set, works out his problems with the actors, and stages the material the way he'd like to have it run. There are directors who push actors around within a given frame during rehearsal, but for the most part you'll find them working it out with the actors so that the scene falls into place and plays well in the room from the point of view that he wants to photograph it. Once that's done, and the actors are comfortable, then you come in and set up a finder, and you start cutting it up as to how he'd like to cover it. Then the actors go away, the stand-ins come in, and you light. That's the right way to do it. Now, a lot of times a director will say, "They're going to be over here in a corner and he's going to be reading a book." Well, that goes over like a lead balloon with me, because they'll go away and rehearse and change the blocking, and the result is that he's not in a corner reading a book anymore; he's over at the refrigerator. So what you've done is a lot of lighting for a set-up that is irrelevant. It's best that they work out all the problems in blocking on the set, because you're not saving any time by doing it twice. So rehearse, block, go away and rehearse on a verbal level, then come back and we're ready—we shoot. It goes much faster that way.

QUESTION: Could you tell us a little more about how you control diffused light?

WILLIS: I used to bounce light, and I'll still do that for quickie shots. But what I do now—and I've got it down to a fairly good system—is just use 4 x 4 diffusers. There are two of them, actually. One's the frame and the other's the frame with the diffuser on it. We have various methods of using them in a room. Usually the grips will put them right into the ceiling. The second diffuser, which is hanging from that particular frame, is 14 to 20 inches from the bulbs, which are in the first frame. All four sides of that are black fabric, which is rolled up. Now, let's say, for one in the middle of the room, you'd just chop the walls by letting the fabric down. Of course, the higher it is, the less you have to fool with it because of actors walking under it. But when you have actors who are getting too much light in a certain position, you can just slip nets under the top of it.

QUESTION: Are the bulbs pointed directly down?

WILLIS: No. Usually you have them going sideways.

QUESTION: When you speak of a 4 x 4 diffuser, is that a standard lighting fixture?

WILLIS: No. It's one that I made. I made up a whole series of the frames. I used to use silk in them a long time ago, but it's not as effective. It's also too expensive and you can't get it anymore. So, like the rest of the world, I've gone to plastic—which is cheaper. I use a material that I had Rosco make. I call it "shower curtain". It comes in two densities. They came in and showed me the full density, which was very thick. I said, "That's great. Make some half that thick." So they made two densities, and it's terrific stuff.

QUESTION: When you have an idea for something like the "shower curtain" or a special kind of frame or a light that's named after you, do you go to a company that you like and say, "I'd like you to make this."? Do they give you a free supply for the rest of your life—or how does it work?

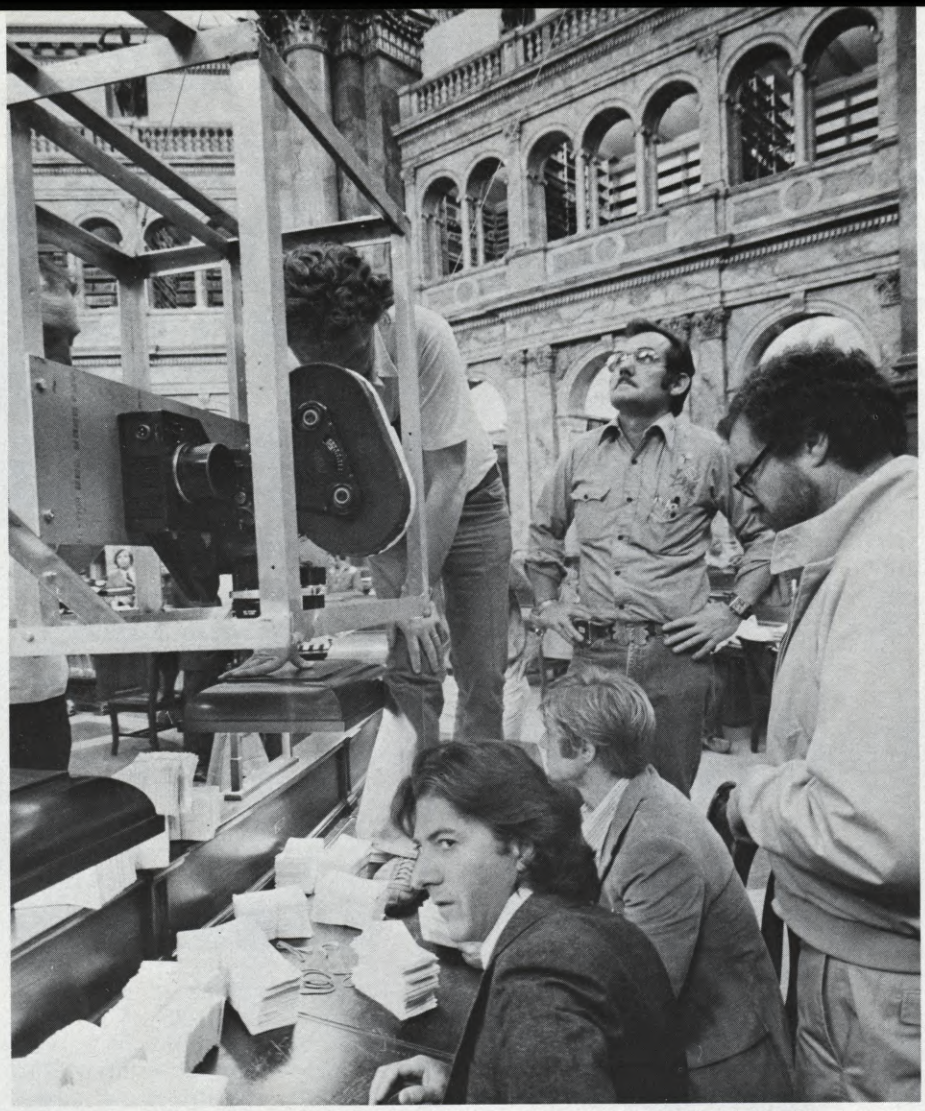
WILLIS: I've never gotten a free supply of anything—and I don't want it. But, no, you sort of cooperate with each other, so to speak, in the business—because you're doing them a service and, in return, they're doing you a service by manufacturing the idea. So just making it available is a service. The hard part is to get somebody to do something new.

QUESTION: Then, does that become your invention, or is it just a contribution that you've made to the industry?

WILLIS: You owe it—I think you owe it. This business has been very good to me. The people in it have been very good to me. I think you owe it to the business to teach people whatever it is that you know—if it's worth anything—and to contribute whatever makes it easier. Movies are very expensive, so whatever you can do to move things along or make production more efficient is worthwhile. I mean, there are many camera manufacturers around who are using ideas that I gave them, but those ideas help other people because they make for a more efficient, more systematic way to work. So, to go in and say, "I've got an idea," but then stick them up is a total waste of time. You get nothing out of it.

SCHWARTZ: This is the only major industry that doesn't have a facility for conducting research on a regular basis. The research comes from guys like Ed Di Giulio, who's in the business of manufacturing cameras. He gets his ideas from Gordon and other cameramen and this is how progress is made. But it's not through the studios having any kind of research organization.

WILLIS: There's more old junky equipment sitting on studio lots than you can imagine. When you do a studio picture,



In the Library of Congress, Willis sets up a spectacular shot, in which the camera, mounted on a specially constructed cradle and remotely controlled, soared 100 feet to the top of the dome to show the entire Library floor with its dozens of desks. A most intricate shot, it took two tries on two different days to get it right.

they're always trying to get you to use their junk that has been sitting there since 1908. It's ridiculous. It's all pig iron; it weighs a ton; and it's unusable, really—at least for me. It's not contemporary material and I can't work with it. They ought to take it out to sea and dump it.

QUESTION: I understand that you did not have a detailed shooting script for "GODFATHER TWO"—a script that spelled out every shot in detail, that is.

WILLIS: No, we didn't. In fact, I hate scripts that say, "You move into that and you cut here." Because, first of all, that makes it hard to read and, secondly, nobody cares. The fact is that the director is going to take it and shoot it the way he wants it anyway. So, no—there's only things like: "Cut to interior, day."

QUESTION: And you don't feel that takes any longer than if it was spelled out?

WILLIS: No. Sometimes you get directors who are writers, but otherwise it's very difficult to predetermine the shot. You can predetermine a concept when you're writing, but a shot you can't. And it clutters the script. In fact, by the time the film's cast and everybody's together, the whole thing is changed anyway.

QUESTION: Do you think that Francis Coppola changed the concept of the film at all as it was being shot?

WILLIS: A little bit—because, as directors work, they see that certain things aren't working. That's working and this isn't. And so, they'll change. But, basically, no. The real changes came in the editing—a six-hour film cut to three hours.

SCHWARTZ: A lot of good work went down the drain.

WILLIS: I don't even want to think about it.

QUESTION: Does it bother you that a lot of your work will never be seen?

WILLIS: It bothers me. I'm not bothered on a personal level because it won't be seen. But I hate to shoot that way. You always have to shoot excessive material for a movie in order to give the director and the editor enough to work with—so that scenes play properly, and also because things you think are working when you do them don't work when you cut the whole thing together. But to shoot double—which is what we did—is horrible. None of us knew what was going to be in the movie. There were no throwaway shots. Everything was hard to do.

QUESTION: Do you think there's any way it could have been planned more economically—so that you could have shot less than double?

WILLIS: Well, as Francis said, if he'd had more time to write, then he could have cut it back.

QUESTION: But doesn't writing involve planning in his own mind what the shots will be?

WILLIS: Sure. But not the shots—the story content, what he has to say. I always told him he loved shooting 200 pages. That's a director's dream—200 pages. But, really, he just didn't have time to, you know, cut it back.

QUESTION: How do you go about reading scripts and making any kind of decision on them?

WILLIS: Badly. I'm what they call a two-time reader. When someone's good enough to send me a script, I'll read the first 12 pages and, if it's no good, I won't read the rest of it. Meaning that, after a while, you know whether there's any taste, any maturity in the idea. It's very quick. Then you read the end of it and, if it looks good, you read the whole thing. The reason that I read a script twice is that a lot of things I've shot I've hated when I first read them.

QUESTION: In preparation for shooting on a particular set, do you like to go in ahead and get it in your mind? Or would you kind of like to forget about it until you're lighting it?

WILLIS: No. I'll get it in my mind ahead of time, because that saves a lot of time. Especially if it's an important set, I like to think about it. I may not know then what the set-ups are going to be, but I'll know how to treat the room, so to speak, and that saves time.

Continued on Page 1001

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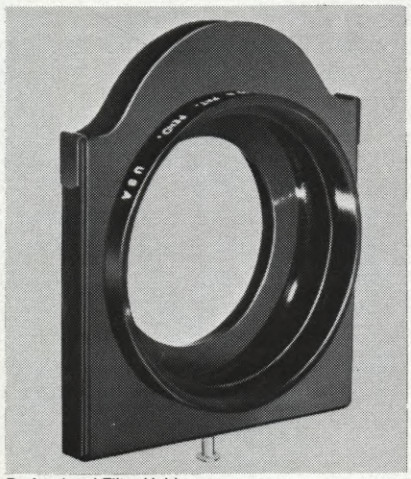

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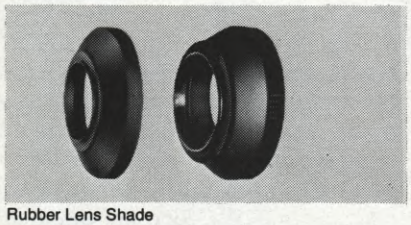

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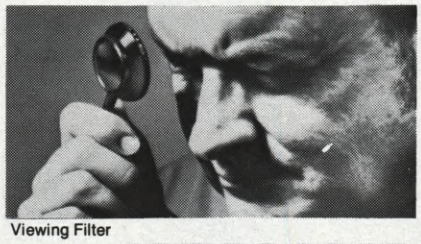

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Continued from Page 950

was ecstatic when I viewed the film on a Steenbeck. The blacks were like velvet, the faces were perfectly illuminated by the candle and the room details could just be made out in the shadows. The effect was perfect—on film. Once in the film chain, this scene could have become a disaster. Firstly, the chain camera would not pick up the shadow detail, so the entire background would go black, and then when the signal got to the home receiver, the black would become a medium gray. The result: two dimly-lit faces amid a fog of gray. The reason for the gray-out is poor DC restoration. Everything in the original scene was between black and medium gray, using only the lower half of the total range available on the film. (See FIGURE 1). Thus, it has room to "float" up to the center position on the home receiver. The trick here is to "fill" the video range completely by including a "white reference". In the above example, I purposely included the candle in most of the shots. While the scene was still occupying the lower half of the signal, the candle flame was right up there at the top. Thus, there was no extra room for the signal to float around, even in the absence of proper DC restoration. The blacks were black, the faces were properly dim and the bright candle even helped aesthetically to justify the dimness of the scene. For most dark or flat scenes, the obligatory white reference can be provided by a strong back or rear side light that creates highlights without diluting the dark or flat ambience of the scene. A hard light in the scene—such as a lamp, candle, neon sign, etc—will also serve the purpose.

The exact opposite situation must also be avoided. A face in front of a back-lit window will work on film, but not on tape or through a video receiver. Here, all the information is in the upper half of the range. The result is that the signal will "float" downward to center itself, with the face going almost black and the window becoming a light gray. In this instance, a black reference is necessary.

The bottom line in video, whether it be film or tape, is filling the 5-stop range by including a black and a white reference, and yet not exceeding this range with high luminance ratios. Aside from these considerations, film lighting techniques apply equally well to television. ■

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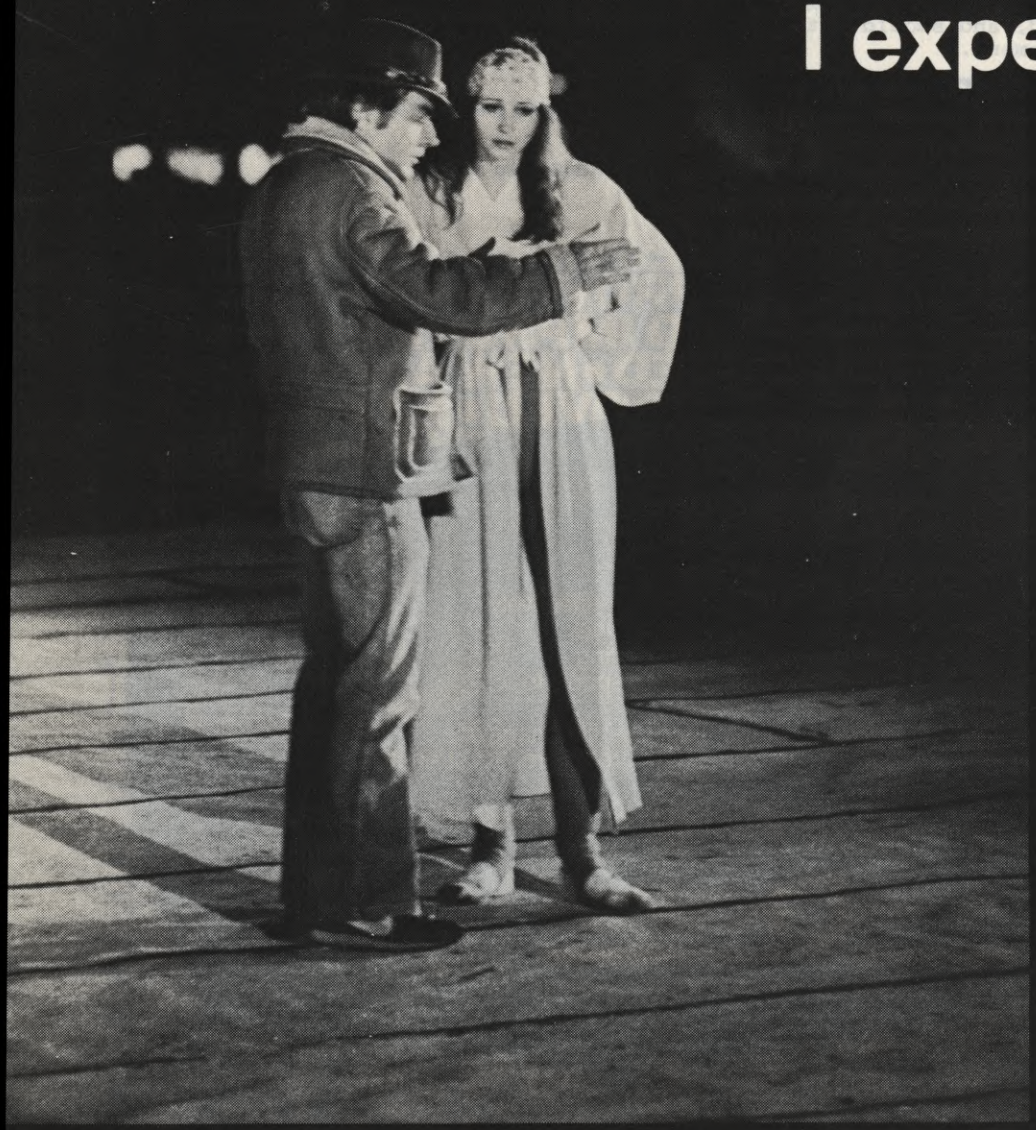

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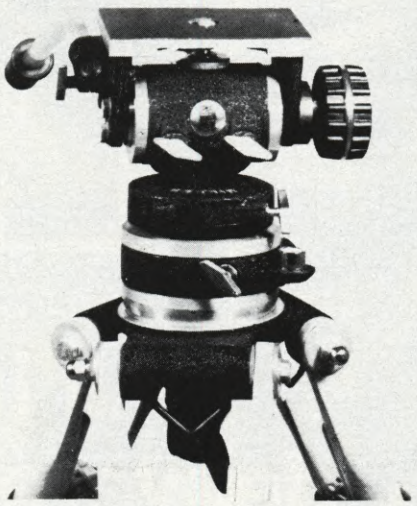

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SEMINAR WITH GORDON WILLIS
Continued from Page 995

QUESTION: I'm curious to know if you used any post-flashing throughout filming of "THE GODFATHER"?

WILLIS: I'm not a flasher. (Laughter). It works very well for some guys, and to each his own. The reason I'm not is that I don't believe in introducing anything more into a laboratory than delivering the film and letting them do what I told them to do. I say, "Just do the same thing every day and everything will be cool." Flashing means handling the film more and more, because they run it through a printer. You can get hung up on so much technology in shooting a movie that pretty soon you can't function, because you've got so much going on. The simpler the tool and the more effectively you use it, the better you can get things done. I don't believe in flashing. I know what it does—I've done it—but I would rather introduce things photographically that I can handle in the camera, whenever possible, because that simplifies it.

QUESTION: Working with your system of overhead lighting, do you still use Obie lights?

WILLIS: Yes, I use Obies. Howard was kidding me before about not putting any light on the actors, but it's true. They accuse me of not letting the audience see the actors' eyes. A lot of times in a scene I'll shut down on an actor's eyes; then, at a given point, you begin seeing his eyes. For that purpose I use Obie lights and I use open bulbs fixed to the front of the camera.

QUESTION: Do you use Foamcore the same way, to put a light in someone's eyes?

WILLIS: Yes, or a white card. There are actors who act to the floor. They come out of the Lee Strasberg school. It's good for theater-in-the-round; it's good for digging ditches; it's terrible for motion pictures. I got mad one day at Pacino and said, "Why don't we get a glass table and just put the camera under the table? All right?" I mean, there's a point where you can't lower the key light anymore. So yes, Foamcore or a white card works very well with overhead lighting.

QUESTION: Did Lee Strasberg in "GODFATHER II" act down at the floor?

WILLIS: Oh, Lee's terrific. He's a nice man. I don't think he believes half that stuff. He once believed it, I guess, but I think the actors do a lot of numbers on him. He was wonderful. He's right there.

QUESTION: Do you want to shoot a black and white picture?

WILLIS: Yes, I'd love to. I've shot a lot of black and white, but never on a feature. The problem with black and white is that it tends to make statements. Somebody says, "Well, we'll make it a black and white film." They don't just shoot the movie in black and white. Now it's become an important "statement" to shoot it that way; whereas, if they'd just go ahead and select it occasionally for a movie, I'd love it. I think black and white is great. It doesn't get in the way of the story. It's actually a more interpretive medium than color.

QUESTION: Do you still use any bounce light techniques?

WILLIS: Yes, I do. I did a movie with Barbra Streisand and bounced myself to death. (Laughter) The way I finally licked Barbra's problem was to have practically all of her key lights coming off the walls. I would key a lot of times by just hanging something onto the wall.

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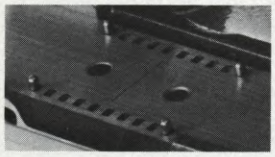

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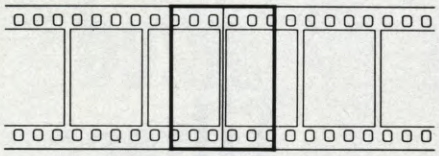

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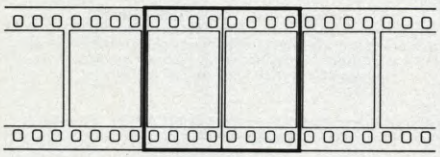

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QUESTION: What material do you use for bouncing—space blankets?

WILLIS: No, they're horrible. White sheets, white cards, white walls. I just have the ceilings painted white on location sets, and use that. It's less directional, very soft, and it works.

QUESTION: Did Barbra Streisand request that?

WILLIS: No. She's really wonderful, actually, in many ways, because she feels and knows that she looks good in certain ways. Most of the time she's right. So your advantage there is that she'll work with you. If you say, "Don't do that, do this," she'll do it, because it's to her advantage. She's interested. She likes to talk about lighting. She had a "left-side, right-side" kind of concept about herself. I said, "Are you going to go through this whole movie left-to-right, Barbra? Aren't you ever going to go right-to-left?" The truth of the matter is that she looks good from both sides, but she thinks she only looks good from one side. Well, if that's on her mind, that's on her mind, and you have to deal with it. I don't particularly like having to light actors for ego reasons. To me it gets in the way of the movie. You can't imagine how difficult it is to do, because you've got a concept for the look of the movie, and at the same time you're dealing with how a personality is supposed to look. It's tricky, because you've got to make the movie look like one thing, while making him or her look like another thing within it. But I managed to do it, actually, and it worked out pretty well. It didn't bother me.

QUESTION: When you bounce light off the white material, do you always use it on a flat surface? The reason I ask is because many still photographers use curved reflectors, umbrella lights and such—but Billy Putnam once said that using them generally was a mistake, because a parabolic reflector focuses the light.

WILLIS: He's right. When you take a light and flatten it out against a wall, it won't be as directional as umbrella light, but I like umbrellas sometimes. They're terrific for certain things.

QUESTION: How about parachutes?

WILLIS: Only for jumping. (Laughter) They get too big.

QUESTION: But they give a nice soft light. They're used in shooting commercials—why not features?

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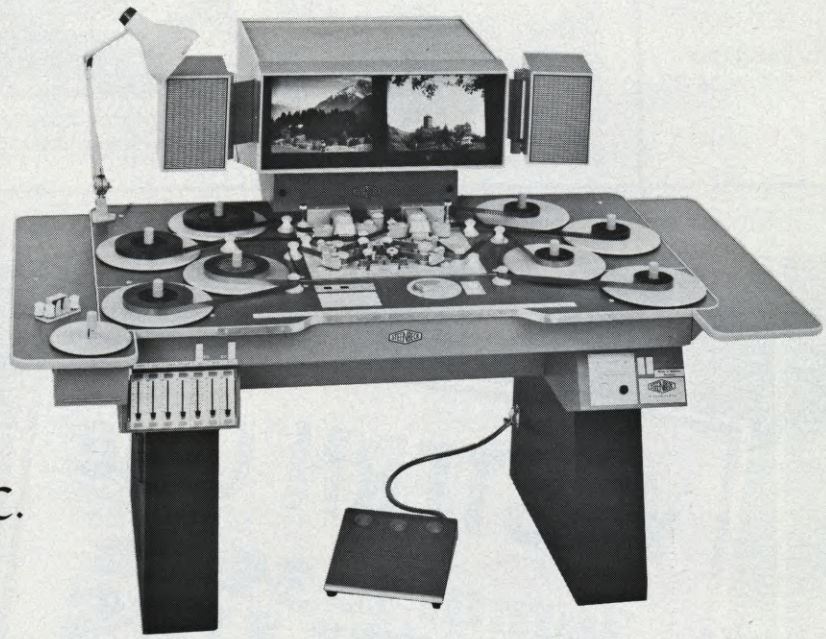

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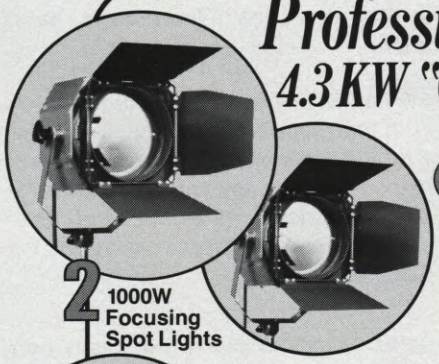

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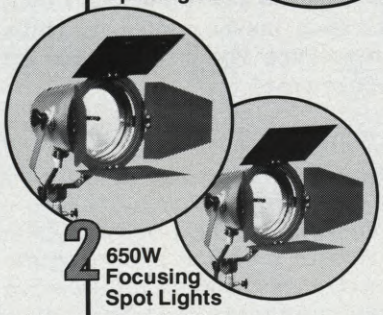

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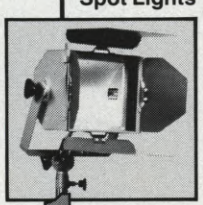

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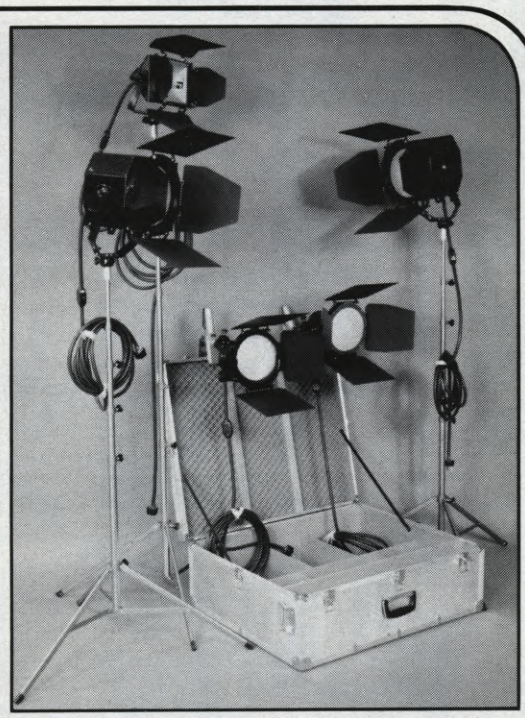

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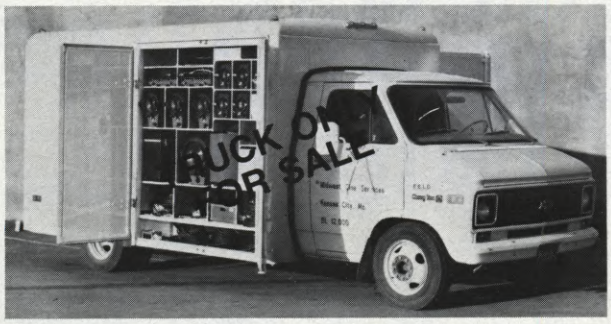

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WILLIS: Because you've got actors and hundreds of people walking around and talking—and soundmen. You sort of have to make everything work within the structure that you're faced with. On the other hand, one man's thing is another man's poison—or something. If somebody's used to working with a certain thing, he should work with that.

QUESTION: With your concern about laboratories, did you have the European footage developed by Technicolor in Europe?

WILLIS: Yes—Technicolor in Rome, for both pictures.

QUESTION: What was your comparison between the labs?

WILLIS: The Italians do very good work—better work, actually—if you can live through the emotional upheaval of getting to them. It has nothing to do with technical things particularly. It has to do with the emotional aspect, but once you solve the emotional problem and they understand what the movie is about, they're wonderful. They just do lovely work, but you've got to go through a thing.

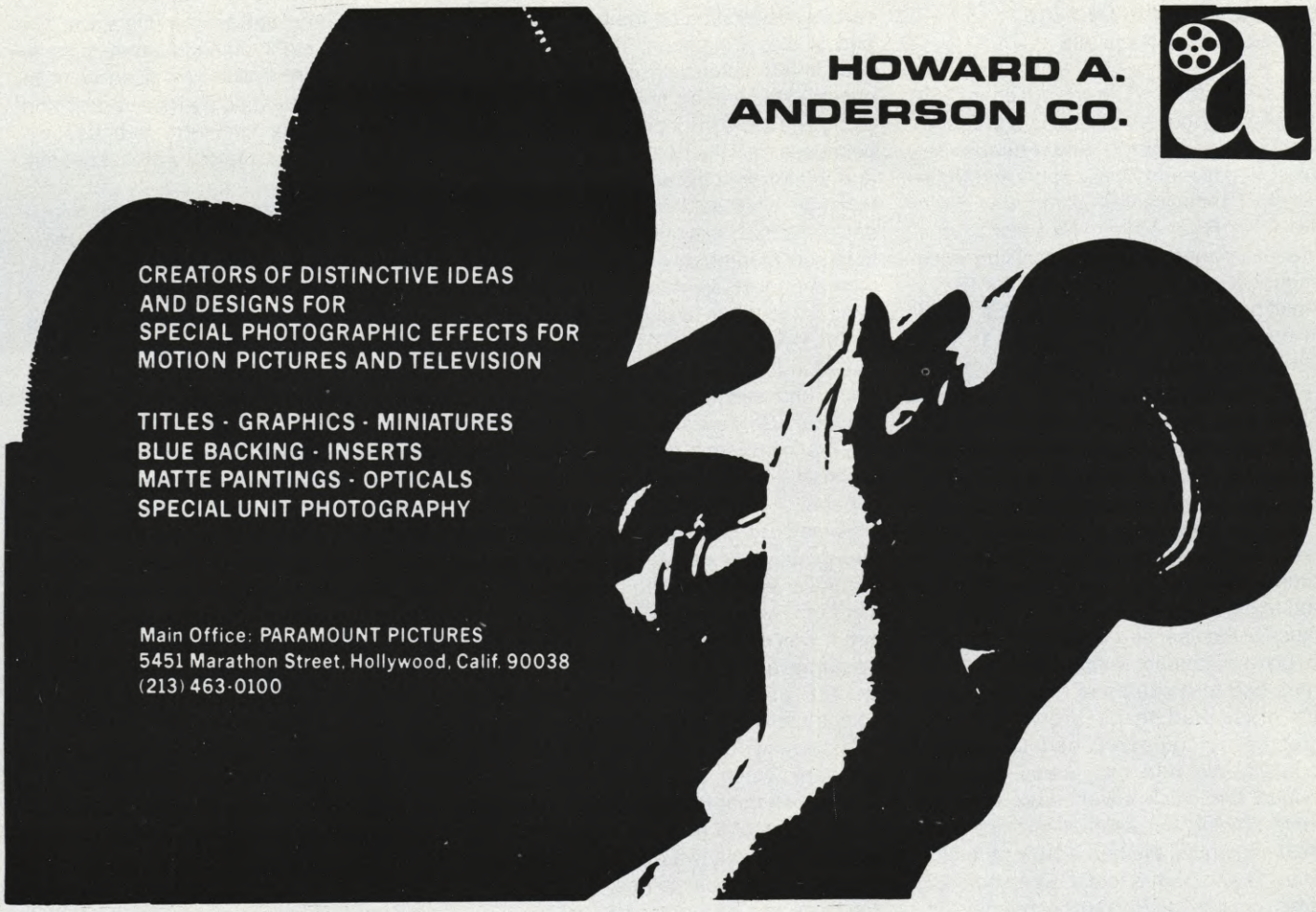
QUESTION: Are you at all concerned about how your photography will look in the drive-ins? Everybody hates them.

SCHWARTZ: The drive-in screens are a lot better than they used to be. You get a lot more illumination in drive-ins now than you used to when the question was first raised. As a matter of fact, I haven't heard a producer raise this question in years.

QUESTION: So you're not really concerned about maybe printing up a little bit—requesting lighter prints for the drive-in release?

WILLIS: No, because the truth of the matter is that you're second-guessing every theater in the United States and all over the world. The question used to be: "What're they going to do in the drive-ins?" Well, a lot of drive-ins are still sub-standard in projection, but so are a lot of hard-top theaters. All of them should have to conform to a certain standard of quality. They should have police doing it—running around fixing up theaters. (Laughter)

SCHWARTZ: Gordon, thank you very much for a most interesting discussion ■



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ORDEAL BY FIRE AND ICE
Continued from Page 965

worked in steel mill towns which including Mingo Junction, Struthers and Cleveland, Ohio, Weirton and Follansbee, West Virginia and McKeesport and Pittsburgh, Pennsylvania—all up and down the Ohio River Valley. We went to one town alone just to do the bowling alley sequence, because we could not find a small bowling alley anywhere else in the midwest. Most of these areas are deteriorating—like most of the fine old sections of cities all over the United States—so we were forced to go to many places in order to create the look that we had to have in the film. As a result, the logistical problems were a nightmare.

Added to this was the enormous problem of shooting in mid-July and August during the worst heat wave in 20 years, and trying to make it look like winter because of the deer season. Every shot had to be preplanned, because all of the trees had to be stripped of leaves, and the grass had to be browned. Vast stretches of greenery had to be defoliated. We had two crews working around the clock seven days a week doing nothing but defoliating trees and browning grass. We had a crew of trucks going to and from a forest area some 20 miles outside of Pittsburgh bringing in bales of dead leaves. We used tons and tons of leaves, and often the defoliating crew would finish just hours before it was time to shoot. It would get down to 20 men pulling leaves that hadn't fallen off the trees because the defoliants wouldn't work if it had rained the day before.

There was a lot of pressure because of that. You couldn't move the camera five degrees to change a shot, because you'd run "off the set" into green trees and grass. The entire filming had to be totally laid out in advance, and that meant very careful preparation on the part of myself and Vilmos Zsigmond. Because I had seen the locations so many times, because I was writing the script as I went along and knew the locations so well, and because I took the heads of departments and Vilmos with me when scouting locations, we were able on the spot to make decisions that we would have to stand by some six months down the road. I don't think a project like this could have been done without that amount of preparation. Fortunately, the start of filming was postponed until July because of Bob De Niro's unavailability, and the March date forgotten. So we lost a winter, but gained all the problems of shooting in the summer—which were absolutely formidable.

Sometimes it was 120 degrees outside during the week we were shooting inside the trailer and we were right next to the steel mill, which made it just terrifyingly hot. It was so hot that between takes we would have to give the cast a complete change of (winter) wardrobe. Everybody's hair would have to be blown dry and they would have to have new makeup, which sometimes created a delay of 45 minutes between takes. We would just make it to the end of a take before everybody was wringing wet and had to change their clothes. And yet, you don't see any of that in the film.

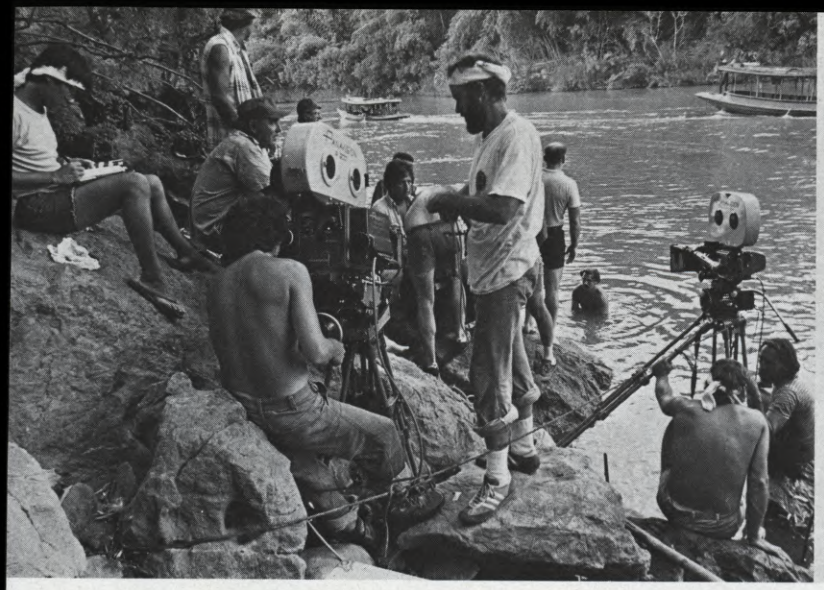
Vilmos and I spent several days shooting tests to determine the exact look of the picture. We decided on a different look for each of the "three acts" of the film—the town, the mountains and Vietnam. Each one has its slightly different visual quality and texture. The mountains look very different from the town, and the town looks very different from Vietnam.

We constantly had to manipulate reality because, as I said before, I wanted to keep the steel mill in the background of almost every exterior shot. As a result, you think you are seeing one town, but those are eight different steel mills in eight different towns. We even went to the extent of clearing a whole tract of land and building a cemetery because we couldn't find a cemetery with a steel mill behind it.

We also did a number of other things that are usually not done. For instance, considering that it is a non-musical picture, this film has a great deal of music in it—more than 70 minutes—and a large portion of that is in the wedding and wedding reception sequences, the reception being two reels long. For that entire section, including the sections in the bar that have music, we recorded the dialogue with playback on location as our production track; we did not do it the other way around. In other words, the dialogue that you hear is not looped, and we did that on purpose because there is an artificiality to looping that is inevitable. If you loop scenes that should have an immediacy and spontaneity to them, it is impossible to capture that spirit a year later. You can't do it, so we took the terrible chance of making our playbacks on the spot with the band and then recording the music and dialogue simultaneously. It's got a life to it. Not only that, but it's the first time I've seen a movie in which all of the people in the background are clapping and dancing in tempo. Nobody is out of tempo, because they're not faking it to a click track or a light or whatever. There is all the difference in the world in the action when that music is playing, as compared to when it's not playing. All the self-consciousness is gone. Of course, the editorial and music staffs went crazy, but the result is well worth it.

We went for broke in many cases in order to get a vivid result. For example, when we were working in the Cascade Mountains in Washington to shoot the deer hunting sequences, we had trained

(LEFT) The filming of the elaborate, tradition-bound wedding ceremony in St. Theodosius' Cathedral was staged with complete authenticity. The building itself, a replica of the Czar's church in the Kremlin, served as a sumptuous background for the action. (RIGHT) A pensive Cimino ponders his upcoming shot, while priest holds symbolic wedding crown above his head. Since the director had once been Best Man at such a wedding, he had first-hand background data upon which to draw.



(LEFT) A most remote section of the River Kwai wilderness was selected as a filming location. Characterized as "the least populated spot on earth", it was nevertheless said to be alive with bloodthirsty smugglers, necessitating round-the-clock bodyguards for the director and stars. The company doctor carried 27 types of poisonous snake venom antidote in his kit. (RIGHT) Much of the filming on the river was done from a motorboat which, with the power cut, made a smooth camera platform.

deer and the normal complement of deer trainers. In order to work in a national forest with animals, you have to fence in the area, and I don't know how many acres on those precipitous hillsides at 16-degree angles we had to enclose with 12-foot-high wire fencing, camouflaged with trees to keep them out of camera range. The trained deer could work only within sight of their trainers and the problems were enormous.

Even so, the animals didn't look right. They looked like exactly what they were—*trained* deer. I said, "We've got to get real deer, *wild* ones." And they said, "You can't have wild deer." But I decided that we needed two wild stags and insisted on flying them in from a game preserve in New Jersey. They were airfreighted to Washington and brought by truck to the top of the mountain. They worked better than the trained animals; they were magnificent looking. I had to insist on some things in order to get a certain quality, but fortunately, when you're working with people like Bobby De Niro and Vilmos Zsigmond who care as much about quality as you do, you've got a tremendous force behind the picture.

It was Associate Producer Joann Carelli who suggested Vilmos to me as Director of Photography. She thought that the two of us would get along and that he would be the best possible person for the job. I listened and we met and it turned out happily.

Our location site in the Cascades was very remote—so much that it required six hours of travel time for the crew each day, three hours in and three hours out. The weather changed every five minutes. At one point, we had four cameras set up on a ridge. We had two set-ups, one on each side of the ridge, so that if the weather cleared on one side we could whip the camera around and shoot, or if we got wiped out and the light started getting better on the other side we could shoot that. We fought the weather every instant.

There is one big panoramic shot in the picture where you see Bob De Niro on that ridge. Vilmos and I got to the location at 8:30 one morning and the light and clouds were exactly right; we couldn't believe what it looked like. I got Bobby on the radio, in his dressing room, and I said, "Get dressed in two seconds and run all the way over here, because if you don't run we won't get the shot." He came running from his trailer, still buttoning his shirt. I said, "Okay, walk from here, stand there and then go down to the other side." We rolled the cameras; he followed directions exactly, and by the time he got to the other side the effect was gone—and it never looked that way again during the entire time we were there.

We spent some three-and-a-half months in New York with a researcher going through all of the network footage

Continued on Page 1026

(LEFT) Cimino gives direction inside actual native hut dismantled and reconstructed on the location. Measuring 15 x 18 feet, it had to accommodate eight actors, at least as many technicians, plus considerable camera, lighting and sound equipment. It was built on floating platforms in order to be able to rise and fall with the fluctuating level of the river. (RIGHT) A removable bamboo panel in the roof of the hut permitted soft diffused light to flood the set for basic illumination.

SHOOTING "IT WAS NEVER IN THE MUSIC BOX"

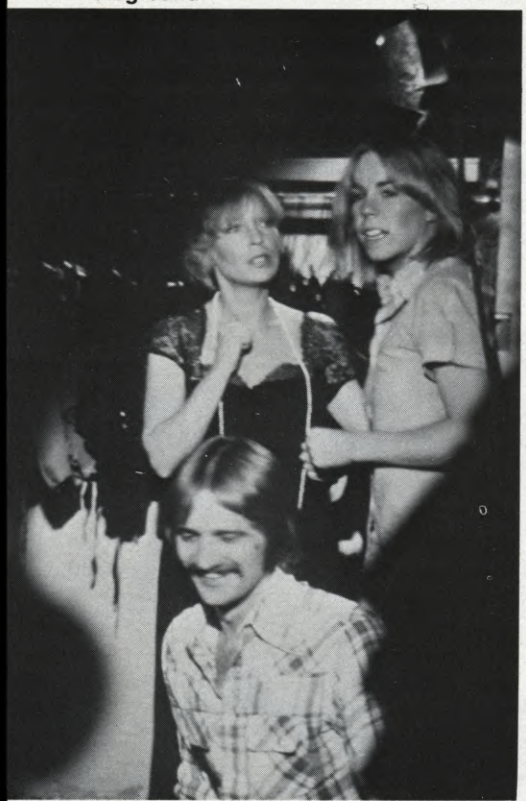
After three-and-a-half years of making commercials and documentaries, young technicians of a Colorado film production company use ingenuity in place of an adequate budget to produce their first dramatic subject

By ROBYN BENSINGER
Associate Producer/Assistant Director

Writer/Producer/Director Ed Warnick and I decided to produce our own dramatic film after three-and-a-half years of making commercials and documentaries in Colorado. A perfect tapestry of talent exists right here in Denver. Both the intimacy of our crew (having worked together for over three years), as well as their technical expertise, we felt, would be very positive elements in creating the film.

Filmmaking in Colorado consists largely of producing commercials and documentaries for regional and national clients. The state's sunny climate and beautiful scenery have lured major film production units into Colorado to produce commercials, documentaries and features. They have found a variety of locations available here for filming, and at the same time discovered Denver's many talented young filmmakers. Today, many fine commercial and documentary productions are created in Colorado by these artists. Together, we felt our combined experience would enable us to produce a dramatic film utilizing the technical expertise we had gained from our past commercial endeavors.

Professional stage actress Ginger Valone, in her first time before the camera, gains confidence from Associate Producer/ Assistant Director Robyn Bensinger. Director/writer/producer Ed Warnick in foreground.



A first dramatic piece for nearly everyone involved, "MUSIC BOX" generated incredible enthusiasm among the crew. Given the opportunity to freely express their own ideas, each individual offered their personal and professional contributions.

We began pre-production in early August, 1977. My responsibility was to insure a smooth, economical production. Our shooting ratio was 6:1 for a half-hour dramatic film, so a very detailed storyboard was drawn after careful inspection of the American Costume Shop. It included every camera move, angle, lens and lighting specifications. We held several full crew pre-production meetings far in advance to avoid unexpected problems.

Ed Warnick had been writing screenplays while shooting film for commercials and documentaries over the past few years. He explained his motivations for writing "MUSIC BOX". "I had written features but had no portfolio as a director. I wanted to conceive and execute my own idea, so raised the money myself and directed a dramatic film.

"I had several ideas which melded together one day as I walked through The Costume Shop in Denver, pricing clothes for another film. I found myself fantasizing, with each period costume triggering memories, attitudes and style for my various ideas. The Shop lent itself to interesting photography.

"Rather than make a fantasy film, I tried to use the Costume Shop as a vehicle to tell the story about a woman's inner struggle for identity. In essence, I came home that day and wrote 'MUSIC BOX'. The Shop's atmosphere stimulated the woman's memory, showing the audience her entire life in a condensed amount of time.

"I was fortunate enough to do the film at a time when other freelancers wanted to work on a dramatic film. Their reduced rates and donated time allowed us to produce the film on a limited budget."

Pre-production was not limited to technical planning. Ed and I both felt the need to share our philosophy behind "MUSIC BOX" with the crew. Together with our cameraman, Doug Smith, and our gaffer, Jim Kelley, we had several meetings to discuss what we wanted to do with the film.

As Ed explained, "The film was shot in four 12 to 15-hour days and it would have been impossible without thorough preproduction planning. The vehicle of my film, a woman locked in a costume shop at night, set a predetermined mood for light. We went to the shop to see how the backroom of costumes actually looked at night in order to be true to the script. I wanted a very real atmosphere with natural light. I also wanted to create a sense of vulnerability.

"As with the light, I wanted the cinematography to complement the action without drawing attention to technique. I discussed this with Jim and Doug and so drew extensive storyboards, planning each shot and cut in advance of filming. Having calculated every cut, I knew exactly what I needed from each scene, and I limited effects to two dissolves for major transitions in the film. It was an advantage for Doug to both shoot and edit the film because he too was able to anticipate cuts.

"Blocking scenes with the talent, Ginger Valone, proved especially advantageous. She had had extensive stage experience, but little film experience. Because the shop was unavailable to us, we couldn't rehearse on location. However, Ginger had seen the shop and knew where the scenes would be played. Unsure of how to relate to the camera, Ginger was concerned about its presence. I didn't want to confine Ginger by setting marks, so I had Doug maintain a loose head on the camera to follow her moves. Allowing Ginger to move freely reduced her inhibitions. The dramatic nature of the film dictated relaxed spontaneity. Therefore, she was most convincing in her 'rehearsal', or first takes."

Doug occasionally felt a sense of documentary style in filming "MUSIC BOX". Because Ed thought Ginger's freedom of movement was important, Doug had to anticipate her actions. For one particularly long five-minute take, Ed briefed Doug on approximately when Ginger would sit up and lie down, or exit frame. Jim had to place his lights accordingly to accommodate Ginger, hoping she could "feel" the light and shadowed areas.

Unable to rehearse for sound presented a challenge to the sound recordist, Garrett Collenberger, as well. So often Ginger's voice was just a whisper, but in several scenes her range

(LEFT) Although the project included filming of 22 night exterior scenes, most of the action of "IT WAS NEVER IN THE MUSIC BOX" was shot inside the American Costume Shop in Denver, Colorado, where one of the film's two professional actresses, Lee Gallup, enacts the role of the clerk. (RIGHT) Locked in the shop at night and reliving her past through the costumes she finds, Ginger Valone rehearses scene in which her character finally realizes her separate tormented identities.

broadened to near screams. A few scenes were shot only once because of Ginger's emotional exhaustion after the first take. Garrett compensated brilliantly for the extreme audio levels, suggesting the film's similarity to documentary recording.

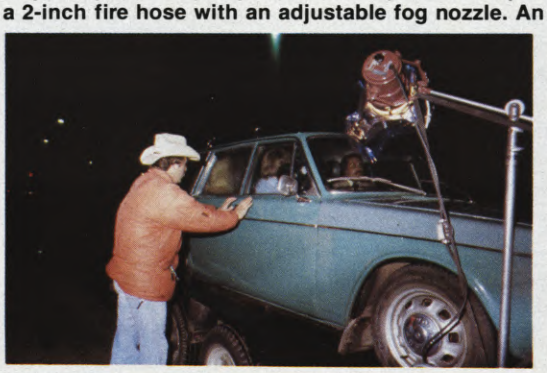
Ed originally felt that "MUSIC BOX" would be a 15-minute film. "A personal achievement in making my own film was witnessing my style . . . how I'd actually direct a shot. There were many long takes—very moody, deliberate slow movements. The finished film is 32 minutes long and I'm pleased that I didn't sacrifice its length for more conventional, short takes.

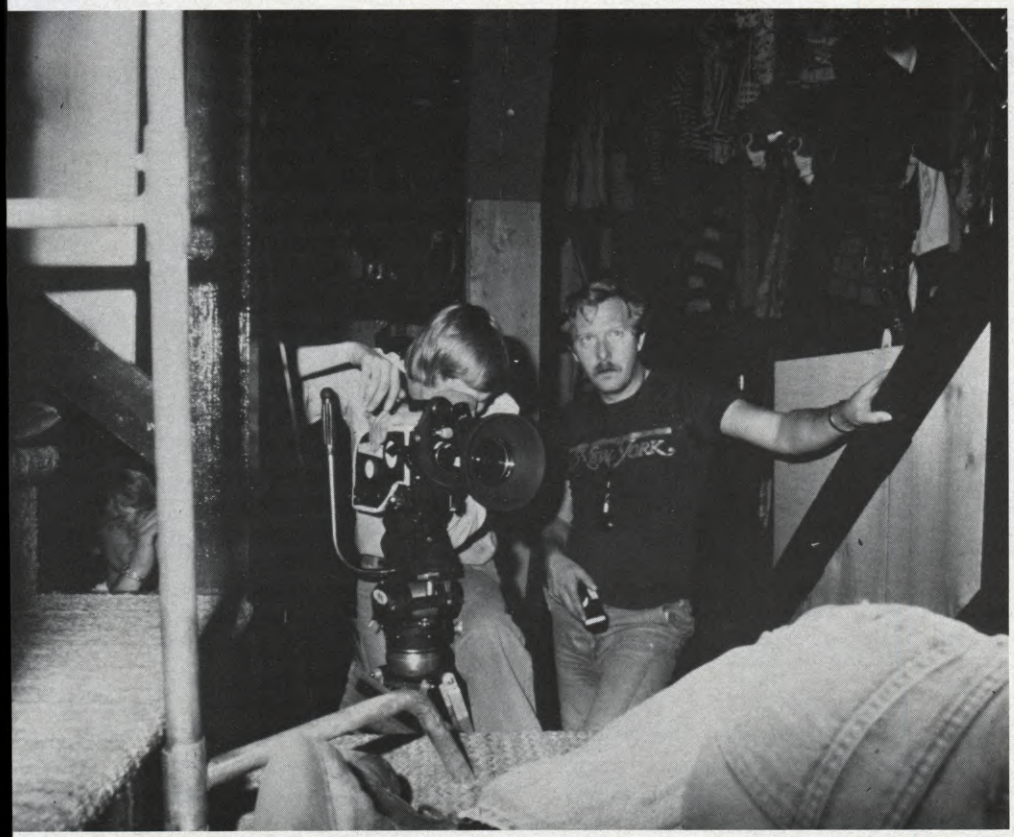
"With a great deal of help and interest from Ginger we were able to analyze this woman, discovering every available avenue for portrayal. The rehearsals consisted of discussion and character analysis, rather than formalized dialogue practice. As the part was essentially a monologue, it was extremely demanding. Long takes helped Ginger build her emotion in each scene."

The entire film takes place at night. Ed chose Kodak's 7247 color negative film stock for "MUSIC BOX", as he felt he could rely on "its superior quality with low light levels."

"There were places we didn't light and I

(LEFT) Cinematographer Doug Smith and Gaffer Jim Kelley discuss the lighting of a scene. (CENTER) To establish practical sources, 150-watt enlarger lamps were installed in all the light fixtures throughout the store. (RIGHT) Setting up in close quarters of the costume shop back room. (BELOW LEFT) Gaffer Jim Kelley studies the possibilities for lighting a scene. (CENTER) Kelley supervises lighting of car mounted on trailer for night driving sequence. Balancing was tricky, because a wide aperture opening was being used in order that the lights in store windows and street lights would pick up. (RIGHT) Grip Mike Waters (who lived up to his name that night) demonstrates how "rain" was created by spraying water from a 2-inch fire hose with an adjustable fog nozzle. An economical way to create the effect.





Cameraman Doug Smith lines up camera, while Jim Kelley checks lighting in preparation for shooting a scene in the bowels of the costume shop. Mood lighting was very important to the creation of proper atmosphere in respect to the flashbacks suggesting other times and other places—with a touch of fantasy to suggest the "might-have-beens" of the main character's life.

knew that 7247 was capable of pulling out the details in shadowed areas. I also chose to use a double ¼ fog filter to take the edge off the picture. We used practicals as light sources for an intimate effect, as well as for key light. We also hung working lights so that when the practicals were turned off, sources of night light were believable. We shot between f/1.9 and f/2.8 and I was really pleased with the film's quality . . . tight grain, good detail and the blacks are black. ALPHA CINE in Seattle has, in my opinion, the best 7247 line in the country and our processing, workprint and timing were unequaled in terms of quality."

Cameraman Doug Smith agreed with Ed on his choice of film stock. However he disagreed with Ed on using the fog filter at first. "I've always felt that it was best to use as little glass in front of the lens as possible. I changed my mind as a result of Ed's feel for the film. We used a Harrison double ¼ fog and upon seeing the film I bought one myself. It was a nice effect, somewhat removed from reality."

Gaffer Jim Kelley described his approach to the film. "The available light look was most important. It was a matter of making the film look natural. I like practicals. The simpler you light it the better it looks. Using the fog filter tended to spread the light of the practicals. Any more than the double ¼ fog might have been offensive. Fortunately the practicals were softened just enough. We hung night lights with 150-watt enlarger bulbs and used them as practicals, which gave us an effective and quick source of light. One-quarter and one-half Tough Blue gels were placed on several lights to give us a cool, nighttime *ambiance.* On all our dolly shots we set up nook lights for small hints of light on the clothes racks. We wanted to attract little attention to the lighting and I think that's the essence of light.

" 'MUSIC BOX' was a first dramatic piece for all of us. We were locked into a certain 'look' the first day of filming and we had the advantage of a week in between each shooting day to screen the dailies and get a good perspective on maintaining the established mood.

"We were using a super lens—the Angenieux 9.5mm-57mm, T/1.9. Having seen what we had accomplished after the first day of filming I knew what I could create with the extremely low light levels." Doug chose the 9.5mm-57mm because it's a very sharp, fast lens. Also, time and cost were major factors, so we decided against using normal, hard lenses. An Eclair NPR allowed us to shoot in many awkward but necessary camera positions. The Eclair was convenient in the cramped quarters and its viewing system's bright image was helpful in photographing the low light.

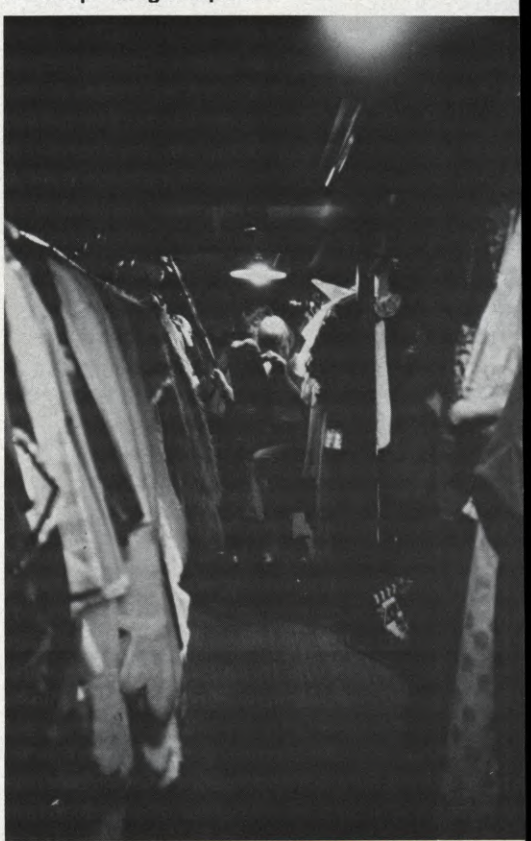
In the mannequin scene we needed to shoot with two cameras, as we had only one mannequin to smash, so one chance to film. We used an Arri M as second camera and shot at 48 fps, allowing pieces of plaster to hang in the air for added effect.

A unique use of color and black was evident in various scenes of the film. According to cameraman Doug Smith, "Each scene has its own feel. In the childhood scene there was a nice split. The woman was cold from having walked in the rain. A stark streak of light intruding into the blackness stimulated the woman's thoughts about her father in the beginning of the scene. She withdraws into darkness, then appears in a doorway wrapped in cool blue night light. A pink hair ribbon completes the suggestion of color in her childhood."

The use of black in the film was of critical importance. Its purpose was to suggest a believable passage of time between Ginger's wardrobe changes and her extreme emotional transitions. Large parts of some of the frames were totally black. Streaks of light hinted at costume detail. Rather than fading to black, we achieved a better effect by planning our cuts and shots to include total blackness

Continued on Page 1023

An Elemack dolly was used to execute tracking shots down the narrow "corridors" between the racks of costumes in the shop—a tight squeeze.



BEHIND THE SCENES OF "THE DEER HUNTER"
Continued from Page 960

The story is told against the actual backgrounds of the immense power and size of the steel mills with their twelve-story-high fiery furnaces, in contrast to the peacefulness and serenity of the surrounding Allegheny Mountains and the brutalizing horrors of the war in Southeast Asia.

THE LOCATIONS

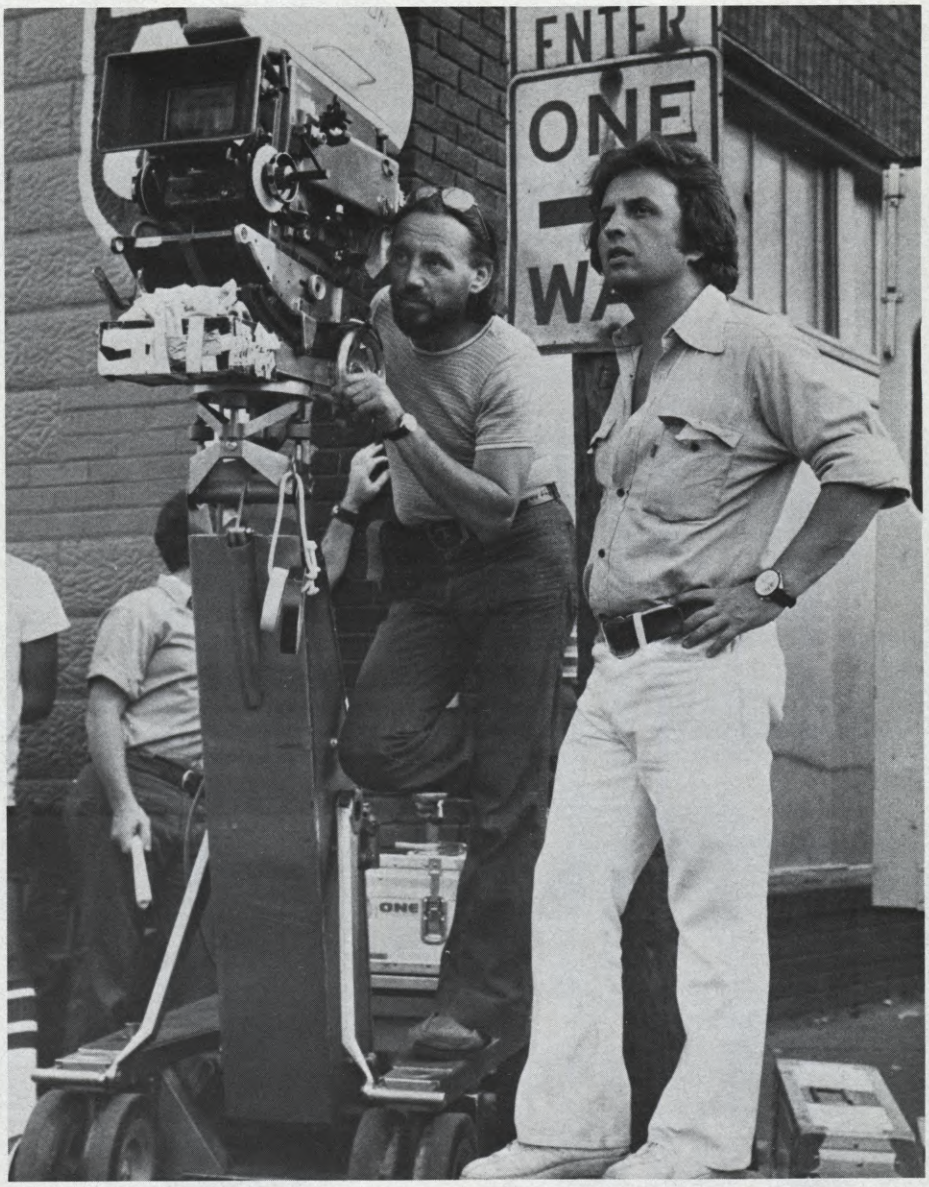
For the first time in motion picture history a film has been made about steelworkers, their ethnic communities and backgrounds, in the actual steel mill towns of Pennsylvania, West Virginia and Ohio. Moviegoers in Des Moines and Stockholm are familiar with the backgrounds of Paris, New York, London and Rome, but they have never seen steel mill towns like Mingo Junction, Struthers and Cleveland, Ohio, Weirton and Follansbee, West Virginia or McKeesport and Pittsburgh, Pennsylvania used as settings for a feature motion picture.

Writer-director Michael Cimino took advantage of this element of novelty by utilizing to the fullest the highly varied backgrounds of this heartland of industrial America. Unlike many other parts of the nation, the steel mill towns are not undergoing drastic changes. The immense and powerful mills dominate each community. The stark skylines are filled with the stacks and steelwork that jut up from the wooded hills.

Viewers of "THE DEER HUNTER" will see a steel mill town virtually unchanged these past 60 years. A key set is Welsh's Bar on Commercial Street in Mingo Junction. Prior to the film company's arrival it was just an old store-front. Under the creative guidance of Ron Hobbs, the film's art director, it was transformed into a place of character that embodies all the symbolism of the story. The Bowladrome in Struthers, Ohio; the McKeesport, Pennsylvania Versailles Cemetery and the V.A. hospital in Cleveland all play important roles in "THE DEER HUNTER".

Probably the most beautiful and unique location used in the film is St. Theodosius' Russian Orthodox Cathedral in Cleveland. It is here that the colorful wedding scenes were filmed. This turn-of-the-century cathedral is an exact replica of the Czar's church which stands behind the walls of the Kremlin in Moscow.

The most fantastic scenes of all were filmed at the Central Blast Furnace of U.S. Steel's Cleveland facility. It was a first for any motion picture. It is a hellish place with unbelievable heat rising in waves. The actors: Robert De Niro, Christopher Walken, John Savage, John Cazale and Chuck Aspergren, fully cloaked in protective leather aprons and asbesto hoods pantomimed the opening of the tap hole of the furnace from which the molten metal pours.



Academy Award-winning Director of Photography Vilmos Zsigmond, ASC and Screenwriter/Director Michael Cimino on location for "THE DEER HUNTER". They were perfectly paired for this assignment, since they are both almost fanatical perfectionists, prepared to endure the worst hardships to get the very best possible result onto film. They did just that—and both manned cameras when the rest of the crew was laid low by illness.

Following the seven weeks filming schedule in Ohio and Pennsylvania, "THE DEER HUNTER" cast and crew traveled to Mount Baker in Washington state for three weeks of filming the deer hunting scenes.

With only one day of rest and recreation scheduled for the filmmakers to recover from the rigors of filming at the 10,000-foot level on Mount Baker, writer-director Michael Cimino put his group aboard a PanAm jetliner with Bangkok, Thailand as the destination.

In Thailand, with the assistance of retired Air Force Colonel Michael Orlando, who was formerly public affairs officer of the U.S. Military Assistance Command in Bangkok, the film-makers restaged Vietnam battle scenes, constructed a Viet Cong prison camp on the River Kwai, changed Bangkok's Don Muang Airport to simulate the U.S. Airfield in Saigon and made a portion of Bangkok's Throng Wad Road a part of downtown Saigon during the 1973 evacuation. ■

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The characteristic onion-shaped spires of St. Theodosius' Russian Orthodox cathedral glow like jewels in the night during filming in Cleveland.

PHOTOGRAPHING "DEER HUNTER"

Continued from Page 967

was important to the story to show our characters playing against the town they were living in. This presented some special problems in staging the night sequences. If we had shot them night-for-night, a tremendous amount of light would have been needed to illuminate those mills in the background. Besides, the mill authorities didn't want us to do that. They had been having a lot of trouble with the government about polluting the atmosphere and they didn't want us to film smoke coming out of the smokestacks, even though the period was supposed to be 1968. They were not about to cooperate with us in any way.

As a result, we had to sort of "steal" those scenes. We knew from the beginning that we would have had to light from the street far away in order to reach those smokestacks—which would have been impossible. As an alternative, I decided to shoot the key long shots at the "magic hour", just after sunset but before complete darkness fell. In this way, the struc-

Looking like a genuine "hard-hat", Zsigmond lines up the Panaflex to shoot a scene inside a steel mill, a key location of "THE DEER HUNTER".

(LEFT) Gaffer Rick Martens strung old-fashioned Masterlights and Space-age HMI units to light up two city blocks for night shooting. (RIGHT) At the "magic hour", the ever-present steel mill looms above the scene. At right is "Welsh's Lounge" where the steelworker protagonists of the film gather to blow off steam. Streets were wetted down to enhance the autumn chill effect (during the hottest summer in 20 years). (BELOW LEFT) The trailer where the main character lives was built by the film company in the shadow of the steel mill. (RIGHT) The trailer lighted up for a night shot.

(LEFT) Inside a U.S. Steel plant, actor Robert De Niro actually goes through the routine of working with the molten steel, having been taught the operations by plant personnel. (RIGHT) The steel flowing from the furnaces emitted a tremendous amount of light. The problem was to balance with 3200°K light at 400 to 500 footcandles for shooting at f/8, so that the actors would not go into silhouette. Actual daylight in the background (reinforced by HMI units) provided a bluish cast for effective contrast with the warm light.

ture of the steel mill would be silhouetted against the sky to pick up the outline and the remaining slight glow would highlight the details a bit. That's how we shot the opening sequence, when the truck rolls out onto the highway, and that's how we shot the scene after the wedding, when they are running down the hill and you see the steel mill in the background.

One can rightly question to what extent those scenes actually look like night—and to tell the truth, I questioned it myself—but now when I look at the film I realize that sometimes you have to depart from reality in order to create the *feeling* of reality. The scenes I'm talking about look different from the way they would look if they had actually been shot at night—but somehow it works, and I think that's why art differs from nature.

Speaking of the lack of cooperation from the steel mills, I must say in all fairness that the one where we shot the interiors was extremely cooperative. The people there liked our story and didn't mind our shooting inside. They even taught our actors how to do the various

(LEFT) Filming the wedding sequence in the vast sanctuary of St. Theodosius' cathedral involved mixing the bluish light coming through stained glass windows with the warm light motivated as a source by the chandeliers. (RIGHT) The use of 3200°K light inside, especially when contrasted with the outside blue, provided golden tones on the faces and golden hair lights that were most attractive. (BELOW) The only hall in which the spirited wedding reception sequence could be filmed had a very low ceiling, which meant that most of the lighting units had to be concealed behind hanging overhead banners.

operations and let them actually work in the scenes.

The wedding sequence filmed in St. Theodosius Cathedral in Cleveland presented a really great challenge, not only because it was so big, but because it was very beautiful and we wanted to make it look that beautiful on film, also. So we took great care and spent a whole day just rigging the lights inside, which included hiding light units behind columns and wherever else we could.

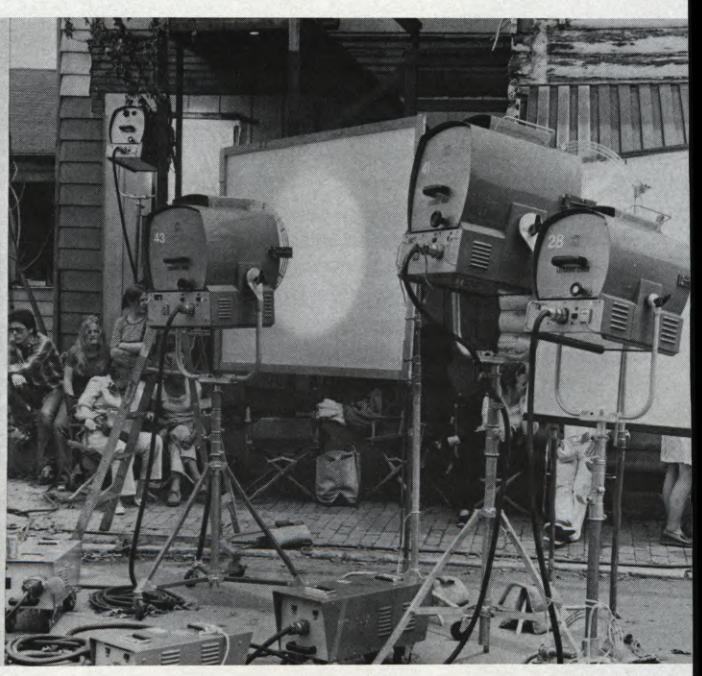
Again we used the technique of mixing the bluish outside light coming through the stained glass windows with the warm light motivated as a source by the chandeliers of the cathedral interior. The use of 3200°K light inside, especially when contrasted with the outside blue, gave us the golden tones on the faces and golden hair lights which I loved in that sequence and which seemed to be so appropriate to the mood.

The wedding reception, which was actually a huge dancing party, presented a difficult lighting challenge, because the only hall that size we could find in Cleveland had a very low ceiling. In the long shots we were shooting from outside in the hallway to show the entire room—ceilings included. The only solution was to hang a lot of banners from the ceiling, like decorations, and these served the purpose of hiding our lights. They also made it possible to use a lot of cross light for modeling. I would have hated to use flat light in that sequence, because the beautiful kicker lights on the faces really made them come alive.

When mixing bluish outdoor light coming through windows with 3200°K light inside, we found the new HMI lights to be very handy. We didn't have to filter them or gel the windows. We would simply turn on a 4000-watt HMI unit and shine it through a window or doorway and it would give us almost as much light as a Brute—without the hassle that goes with Brutes. This was especially important because we didn't have a big crew—only about four electricians. The HMI units are really super lights. Their color temperature never changes and they are very lightweight and flexible. We could hang them up high if we wanted to, or simply mount them on Molevators and raise them 10 or 15 feet. They didn't give us any flicker problem at all, because we had a

Preparing to shoot inside U.S. Steel mill, where complete cooperation was extended to the filmmakers, in contrast to the hostile reception from officials of other steel mills fearful that the film would show their smokestacks belching pollution into the atmosphere. For this reason, night exteriors of the mills often had to be "stolen" by filming them from afar during the magic hour.

(LEFT) Camera tracks with a group of Russian-American matrons, as they enact the traditional ritual of bearing the cake by hand to the wedding reception. (RIGHT) Zsigmond was delighted with the performance of the HMI lighting units, which he found to be almost as powerful in intensity as Brutes. He favors them because they are lightweight and hold an even daylight color temperature, requiring no filtration. Generators precisely controlled to 60 cycles eliminated the flicker problem.



good generator that stayed precisely on 60 cycles, which is very important. Also, of course, the Panavision camera, with its 200-degree shutter, helped a lot to eliminate the flicker problem.

In addition to the HMI units, which represent the latest in film lighting technology, we used a lot of "old-fashioned" lights. My gaffer, Rick Martens, loves the old Masterlights—the very old booster units that are used with Colortran converters. He would simply plug a 500-watt unit into the transformer and boost it up to the light equivalent of a 2000-watt unit.

Rick finds these lights to be very handy and he's very skilled in using them. He usually has a second generator somewhere, like a half-mile away, and he can light up two city blocks at night with just Masterlights and maybe a couple of HMIs to scratch the walls. We found that we could operate very fast with this combination of old and new lighting technology, leaving as much time as possible for the actors and director to get the performances. Since "THE DEER HUNTER" relies very heavily on dramatics and character development, we realized from the beginning that we would have to give the actors lots of time and not spend it all in lighting.

Shooting inside the cramped quarters of the trailer could have been extremely difficult for us, but we made our job much easier by building the trailer right on the location. We actually bought a trailer and cut it in halves and constructed wild walls that could be moved out. In the center of the living room there was a sort of A-shaped ceiling piece that was wild. We could take it down and cover the opening with diffusion material, which gave us a nice overhead soft light on overcast days. We used this beautiful soft light for fill and added our key lights to it, maintaining quite a consistent quality of lighting all day long in this way. Actually, this technique is a very old-fashioned one, since the earliest movie studios in Hollywood had open ceilings and curtains that could be moved back and forth to control the lighting.

The diffusion medium we used is made by 3M and is a kind of "shower curtain" material. For some reason, we called it "velveteen", although it is not at all like velvet. I don't know where that name comes from, but other people call it by different names.

(ABOVE) Shooting inside a crowded Saigon go-go bar (actually filmed in Bangkok) called for hiding many small lighting units wherever they could be concealed. (BELOW) The direct overhead single-source ("pool hall") lighting which Zsigmond dearly loves was brought into play in several sequences, including those in Welsh's bar and Saigon gambling dens. It requires multiple light units to achieve the single-source effect.

Even when we were shooting night interiors inside the trailer we had to take the ceiling off, because we had to have someplace to rig our lights. We would put our lights up and then, three or four feet above them, tent the whole ceiling with black material to keep out any stray light. Even though it was very hot inside the trailer during the day, we often shot day-for-night in there for several reasons. First of all, most people don't like to work a lot at night. Then you have the turnaround problem, which means losing a day in the schedule. This can get very expensive, and since today's productions are very economy conscious, you have to save as much time as possible. That's why we decided to shoot certain scenes day-for-night inside the trailer—which didn't make our lives any easier. It meant that if a doorway was to open during the course of the action, we would have to tent off 10 or 15 feet of the exterior and light some kind of object out there to create a feeling of depth. We couldn't just shoot against black velvet, because the effect would have been completely un-

The crew, in hard hats and protective clothing, set up to shoot a steel mill scene in temperatures that approached 180°F. near the furnaces.

realistic.

We had a lot of fun with the night exteriors, actually, because we had some big scenes to light—several of them extending to two blocks in length. My gaffer just loves challenges like that, and his technique of using the Masterlights and HMIs to cross light the houses in the distance looked very good, especially when we had haze in the middle of the night. Part of this came from the smoke of the steel mills, and then we would often get fog rolling in about four o'clock in the morning. That gave us a glow in the distance, which I liked very much. It created a texture in the sky and behind the buildings of a type which is very, very rare and difficult to get onto film. It's impossible to simulate on a studio backlot, and when it happens on location, it's just gorgeous.

We shot in the anamorphic format—which was essential to the vast scope of this picture—and used Panavision equipment all the way through the filming. We had one Panavision PSR, which I used as the "Number One" camera because I like its viewing system very much. It gives you a very bright image

The peaks of the Cascade Mountains in Washington state were much more majestic than the Allegheny Mountains of Pennsylvania which they "stood in" for.

(LEFT) The slopes of Mt. Baker provided spectacular settings for the deer hunting sequence. However, the weather was far from cooperative, stranding the crew for two weeks in dense clouds of fog and curtailing shooting. (RIGHT) Sometimes an exactly right mood of nature would persist for only a few minutes and had to be shot rapidly. (BELOW LEFT) Fire-bombing sequence of Vietnam village was filmed in a remote area of Thailand. (RIGHT) De Niro inside Viet Cong hut where he and his two life-long buddies are being held prisoner.

and makes it possible to judge composition and focus much more precisely than with the current Panaflex model. But, of course, when you are shooting a lot on location and are pushing through narrow corridors where it is impossible to use the straight viewfinder of the PSR, you really have to use the Panaflex. I like the Panaflex very much, but on "THE DEER HUNTER" I still used the PSR whenever I could because of the viewing system.

On the picture that I just finished shooting, "THE ROSE", I used the Panaflex-X, which is similar to the Panaflex, except that it has a fantastic viewing system that is twice as bright as that of the PSR. So now I am convinced that I will never use the PSR again. There's no reason for it. I will use either the Panaflex-X or the Panaflex, when a rotating viewing system is needed. However, Robert Gottschalk says that the standard Panaflexes will be modified within the next few months to include the new bright viewing system, so we'll be in good shape.

In our preliminary discussions of the Vietnam war segment of "THE DEER HUNTER", we decided that we wanted to make it visually different from anything else in the picture. We even wanted to make it look like it was shot with a different kind of film stock. The new 5247 color negative is so good and so sharp that if I hadn't done something to alter its characteristics, it would have looked just *too* good. What I actually wanted was for the scenes to be shot in Thailand (simulating Vietnam) to look like war or documentary footage.

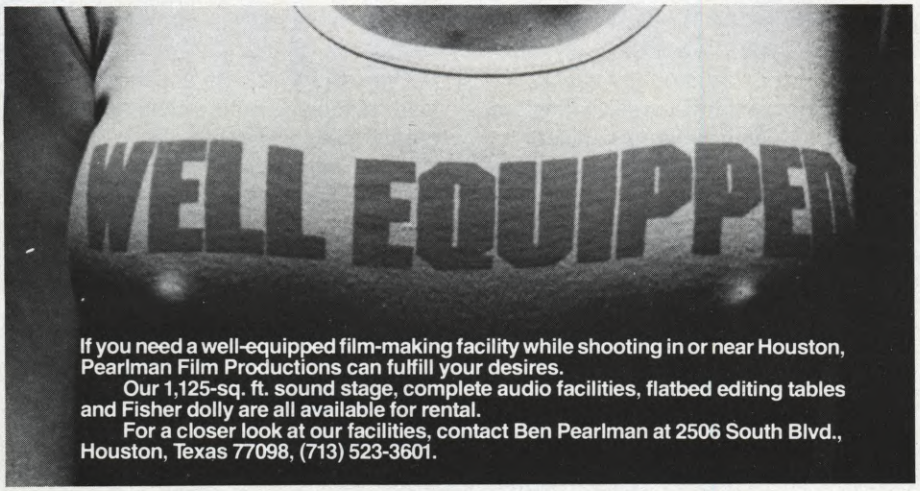
I discussed this with Skip Nicholson at Technicolor and said, "I want to try something and I'll need your help with it. I'm going to underexpose the film three stops and have you overdevelop it three stops."

He said that he would (and I *should*) feel safer if I would underexpose only *two* full stops and have him overdevelop two stops, in order to get a heavier negative and build some grain into the footage. Well, I must say that we really tried to ruin the 5247 to the point where it shouldn't have looked like anything, but the film is so incredibly good that we couldn't destroy its quality. You can monkey around with and do everything to degrade it, and you can still bring it back to look like you didn't do anything to it.

Finally, in desperation, we had to go to second generation printing in many cases in order to bring in more grain and make it look like documentary footage. About 35 percent of the war footage in the picture is a second-generation print, which meant that we had to make a dupe negative, destroying it as much as we could with underexposure and overdevelopment so that the dupe would look crummier. That's how we finally managed to inject a documentary quality into those sequences. If you really study that footage you can see the difference. It's grainier; it doesn't have much shadow detail; it looks older; it looks as if we used some bad film. In a war situation they usually don't keep the film under the right conditions of temperature and humidity. Sometimes it sits around in the sun for weeks and all that.

The majority of the shooting in Thailand took place on the River Kwai in an area that was as remote as it could be. We read a brochure which said that it was the least populated area in the world. It was right in the middle of the jungle, alongside the river, and the local people said that it was very dangerous to work

(ABOVE) De Niro and John Savage cling to the skid of a helicopter during lift-off, while director Cimino shouts directions and Zsigmond hand-holds the camera. (BELOW) The two actors, who insisted upon doing their own stunts, prepare to drop from the helicopter into the freezing waters of the River Kwai.



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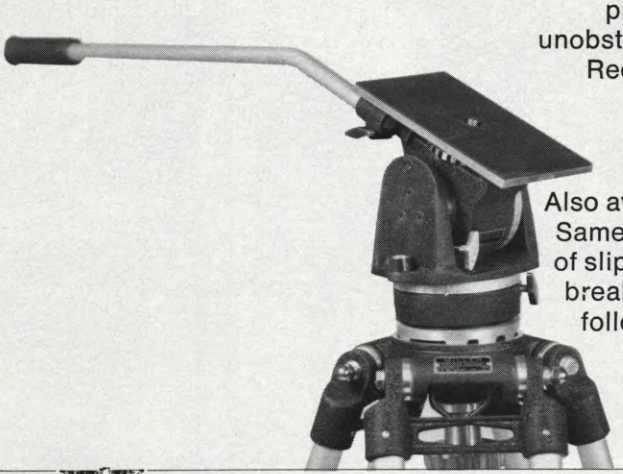

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there because there was a lot of smuggling traffic going through to Burma. The Thai government gave Michael Cimino and Robert De Niro special bodyguards and they weren't allowed to take one step without those guards next to them. Even when we went to a remote restaurant in the Floating Village, we had guards in our van, and many times they would stop in the middle of the road in the dark night and examine something on the roadside that looked suspicious to them. It was quite scarey, but nothing actually happened to us. Either we were lucky or they just wanted to make a big deal about the security.

The River Kwai is quite a river. Its height changes according to the weather and since we were working in the rainy season, its level could vary 10 or 20 feet overnight. The script originally called for a native hut to be built right alongside the water, but we gave that up because it would have been washed away if the river rose, or it would have been up too high for us if the river was low. So we decided to build a hut that looked like it was on poles at the edge of the river, but actually it was floating. It was engineered by our art director with air tanks underneath, but in order to balance it we had to use a lot of sandbags. For example, if we had the camera, the dolly and a lot of people on one side of the hut during shooting of a scene, the hut would be floating off-level, so we would have to pile sandbags on the other side. We had to do this before making every shot and it became a nightmare. Of course, we eventually discovered that in certain shots the camera couldn't tell whether we were level or not, so we ended up shooting a lot of scenes off-level when it didn't matter.

The hut was about 15 feet wide and 18 feet long, but it had to accommodate at least eight or ten actors, the camera crew, the special effects people and everybody else, the dolly and sometimes two cameras, so it was quite crowded. When we were working under the hut where the prisoners of war were hanging from ropes, it was really uncomfortable, because we were standing neck-high in the water. But that's where the Panaflex came in handy. We could put it just under the roof, but just above the water level, and we couldn't have shot it any other way, unless we had been willing to give up the idea of shooting sync sound. We shot everything with sound and many, many times the water rose to just barely the matte box level of the camera—which gave it an interesting look.

Of course, the balancing of light under there was really a problem, too, what with having to run the cables through the water. We couldn't use the HMI lights there because we didn't have a generator that

we could depend on to hold 60 cycles precisely, so we had to use Brutes. We built a floating deck to hold two Brutes and that gave us our key light for shooting on the upper level. For shooting on the lower level, we bounced the light off the water and that created an interesting ripple effect. We used some Masterlights with dichroic filters for closer shots and we tried to keep the lighting low key, since it was naturally dark under the hut.

The hut was built by us and the roof was made of bamboo, which meant that we could tear it apart if we wanted to—and we did so many times. It was the same technique that we had used in the trailer back in the States. We used some diffusion material on top, which gave us an overall nice soft lighting, and we used the Brutes for key light coming through the bamboo panels on the sides. This gave us an interesting lighting effect, which we kept pretty consistent all the way through that horrible sequence in which the Viet Cong are playing forced Russian roulette with prisoners of war.

It was quite a job to hoist the Fisher dolly up into the hut, because it first had to be taken across a bamboo bridge that was floating on the river. At one point the dolly actually took a dive into the river and it took about 14 people to get it back onto the bridge. Luckily we had lots of people to help us.

The Fisher dolly was essential because we had to make many moves during the hut sequence, including up and down moves, and we didn't want to sacrifice that. Since we were using the anamorphic format, such vertical movement became very important in order to keep the composition critical in relation to the lens height, and also to compensate for movement of the actors within the frame.

Many of our shots—for example, the establishing scene of the hut—were shot from a motorboat. We balanced the camera in front, gave speed to the boat with the motor running, and then shut it off in order to get a smooth ride without the vibration of the motor. We just coasted down the river approaching the hut and that gave a fluid look to the establishing shot.

The same boat-mounted camera was used for the escape sequence, when the two men get away from the hut and start floating down the river on a log. The whole sequence was shot from the motorboat, which meant that not many crew people could go with us. We actually had two boats which carried the director, the operator, myself, one assistant, the script supervisor, the assistant director and two sound people. The experience reminded me of the filming of "DELIVERANCE". The river was very

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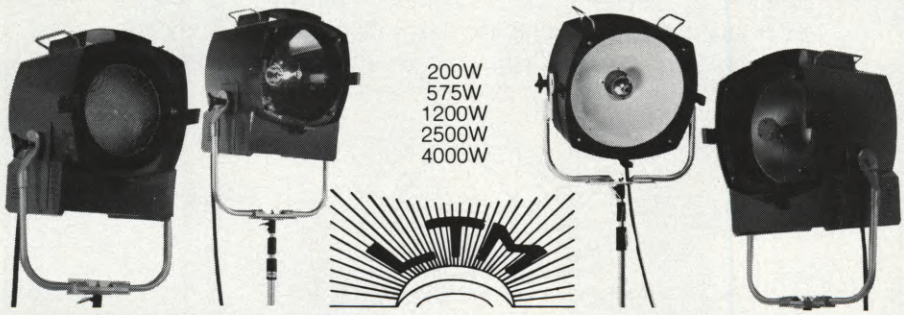

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pretty and we had a lot of fun shooting that sequence.

The helicopter scenes were very difficult to shoot because we didn't have helicopter pilots who were trained for motion picture work; they were just regular pilots. We also had communication problems because they didn't speak good English. We had to go through interpreters and use hand signals and it was necessary to have many rehearsals before we could shoot.

Since we were so far away from the States, we couldn't really get a helicopter cameraman, so I shot the helicopter footage myself and it was quite a challenge to communicate with the pilot. For certain helicopter scenes we used the Continental mount, but for others the camera was hand-held. For the scene where the helicopter landed in the village, my operator, shooting a hand-held camera, jumped out of the helicopter as it touched down and went running with the people in the field. Michael Cimino wanted to have the hand-held feeling in that shot. There were other scenes that were hand-held—like the one where our actors were trying to climb onto the helicopter from the bridge. We needed the space for them to come up the cable, with the camera following them.

I still don't understand how Bob De Niro, Chris Walken and John Savage did that sequence. They had stuntmen standing by, but they wanted to do it themselves. They were hanging off the helicopter from a height of about 100 feet and flying with it. The only thing they didn't do was jump from that height into the water, but they did make a jump from about 20 feet up. Even though the stuntmen had checked carefully for rocks in the water, it still looked very dangerous on the screen. It adds to the realism when actors are willing to do their own stunts. It has a great effect on the audience, because they know they are seeing the real thing.

Things really got dangerous at one point when the skids of the helicopter got tangled in the cable that was supporting the bridge. Our stuntman had to climb out and unhook it while the helicopter hovered there and our actors were on the bridge. It was an incredibly dangerous moment and probably the closest call we had during the entire filming.

It was an almost impossible task to shoot the night sequences in the center of Bangkok, because the Thai people are very curious and whenever they see a film company shooting they gather around. It was impossible to clear the streets. We had originally wanted to hire 600 to 800 people to work as extras in the street scenes, but it turned out that we had about 6,000 in the background—all

for free. We just loved the big crowd and we felt that this was exactly how Saigon must have looked on a Sunday evening, with all the black market activity and the soldiers going into the nightclubs.

It's a great effect. When you see that first shot of the big crowded street, you think you are watching stock footage, but once the camera starts descending on the crane and zooming in to pick up Chris Walken in the crowd, you know that this couldn't be stock footage. It would have been easy to break that sequence up and do it in cuts, but you would have lost the effect of seeing the real thing. Michael Cimino, being a good director, knows how important it is to capture that realism.

There is a curfew in Bangkok that prohibits people from being on the streets after 1 AM. We knew that we wouldn't be able to finish our shooting by that time, so we asked the police what would happen if we ran over. They said that everyone would have to go home, but, of course, we knew that they couldn't make 6,000 people go home who were interested in our filmmaking. As it turned out, they couldn't, so they just surrounded the whole area with police officers and everybody had to stay there until the curfew ended at 6 AM.

I really enjoyed lighting some of the gambling den interiors in Bangkok. My favorite lighting situation is when you can see just one single bulb—pool hall lighting. I'm crazy about that effect, and that's why we decided that in those gambling places we would put just a single bulb in the center of the room over the table. The main characters were right under the light, in the center of the composition, and then the light shaded off into the darkness surrounding them. I used this lighting at least twice in the picture for shooting gambling situations. It looks like the scenes were filmed with one light bulb in the middle of the room, but that's never the case, because one light bulb can never make it look real. You have to help that light bulb, even if it's a photoflood. You have to add cross light in order to get a single light effect.

We shot an interior sequence inside a go-go bar that was really very small. Again, we went for effect lighting and we brought in a Fisher dolly with two risers to make a crane shot out of the opening scene. We had a hard time getting the dolly into the place, but we just couldn't figure out any better way to do the shot. Maybe it could have been done by somebody on a ladder with a Panaglide or Steadicam, but I still think you can get better control by setting up a shot like that with a small crane, just as we did. You know exactly what you're getting—which was important in Thailand, because we

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never saw dailies. We just relied on the lab to tell us what we were getting.

I really like working with Michael Cimino. He's a very dedicated filmmaker and a good director. All he thought about during the shooting was trying to make the best possible film. He won't compromise and he's one of those directors who would always try to do his best under the worst conditions. He will fight with the studio to get more money or a couple more shooting days because he has a certain image in his mind of what the film should be and he won't settle for less. I admire directors who are like that.

I feel that today in the film business there are too many directors who are ready to compromise, who are ready to give in to the economics, and who end up with mediocre films. I like to work with people like Robert Altman and Michael Cimino who really want to do something artistic, creative, powerful.

I never had any problems with Michael at anytime during the shooting of the picture, because he knew the same thing about me—that all I cared about was trying to make the best possible film. I really enjoy looking back at the making of "THE DEER HUNTER". It's possible that some people can criticize certain scenes, and maybe there are things that could have been better, but I guarantee you that we did the best we could under the circumstances. ■

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"NEVER IN THE MUSIC BOX"
Continued from Page 1010

while panning at the head of certain scenes. This allowed us flexibility in the editing room. We never lost sight of our own particular locations in the shop, although no individual location was highlighted.

An unusual combination of warm and cool colors was used in the mannequin scene. Chocolate gels warmed the tight shot, but as Ginger grew increasingly frustrated, a wide shot revealed her cold terror, smashing the mannequin. An eerie contrast of cool blue and chocolate complemented the incredible emotion of the scene. Doug felt the 7247 stock made "using its color to shoot an absence of color possible."

This "absence of color" was particularly evident in another scene which appeared "monochromatic". Soft light warmed a C.U. of Ginger before she slid down a wall into soft blues and blacks. We thought lightning would suggest the bleakness Ginger felt in recalling shock treatments this woman had been forced to submit to. Having originally planned to use an arc welder for the lightning effects, we had to compromise as it was too dangerous in the costume shop. By feathering the plug of a mighty mole we created lightning. We shot a test to check the lighting temperature and felt with strong sound effects our "lightning" would work. Once again, we found that the simplest solution was often the best.

Our exterior shooting was probably the most demanding. Our budget forced us to film all of our exteriors in one night. It was extremely cold that night and "making rain" made us even colder.

We blocked off an entire street and lit small areas for dolly shots of Ginger walking in the rain. The prohibitive cost of renting a water truck forced us to tap a fire hydrant and experiment with a borrowed fire hose. The adjustable fog nozzle created a fairly consistent spray of "rain" for our wider shots.

For the driving scenes, Key Grip Tom Talty suggested loading the car onto a flatbed trailer and pulling it with a pick-up truck. We created rain from a garden hose with a spray nozzle, pumping water from a 50-gallon drum on the truck through a water bed pump. This set up was our alternative to costly car mounts and it worked well. We knew exactly how each shot would cut together, thereby enabling us to film some of the C.U.'s with the car stationary. We created the illusion of constant movement by panning lights by the windows, illuminating rain drops. The windshield wipers suggested movement with their shadows. Kicks of light in the side mirrors also made for an interesting

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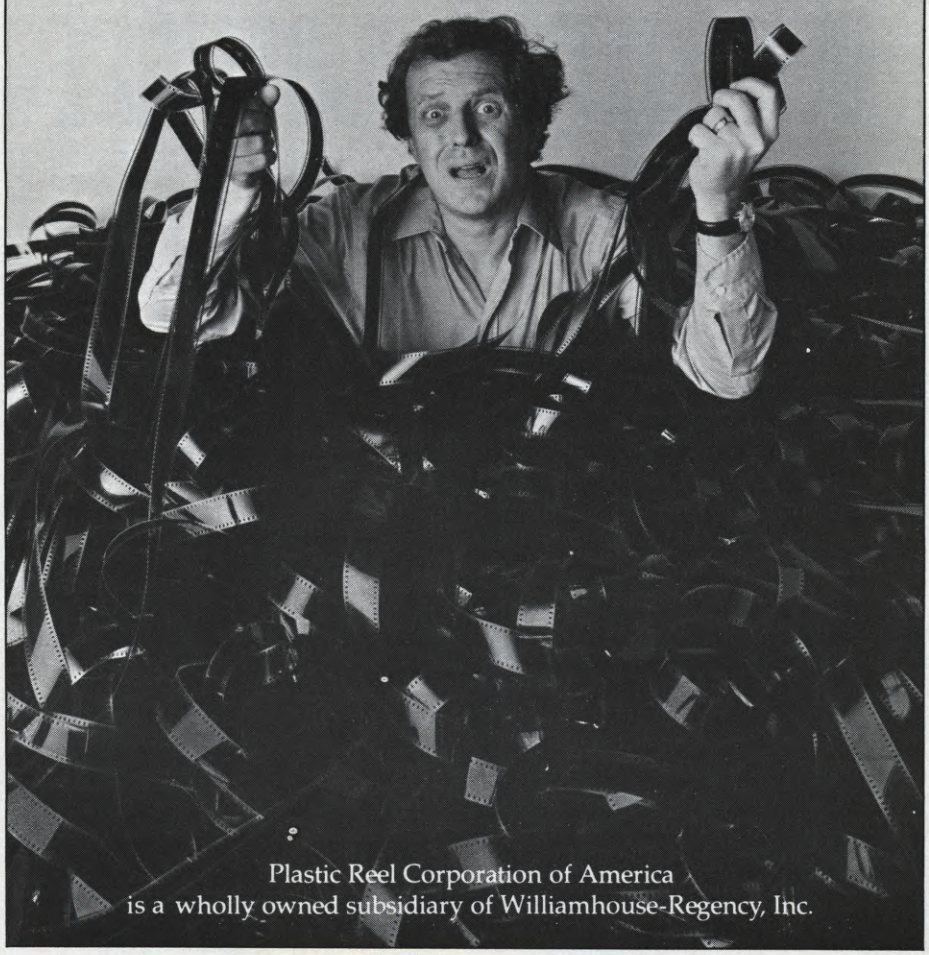

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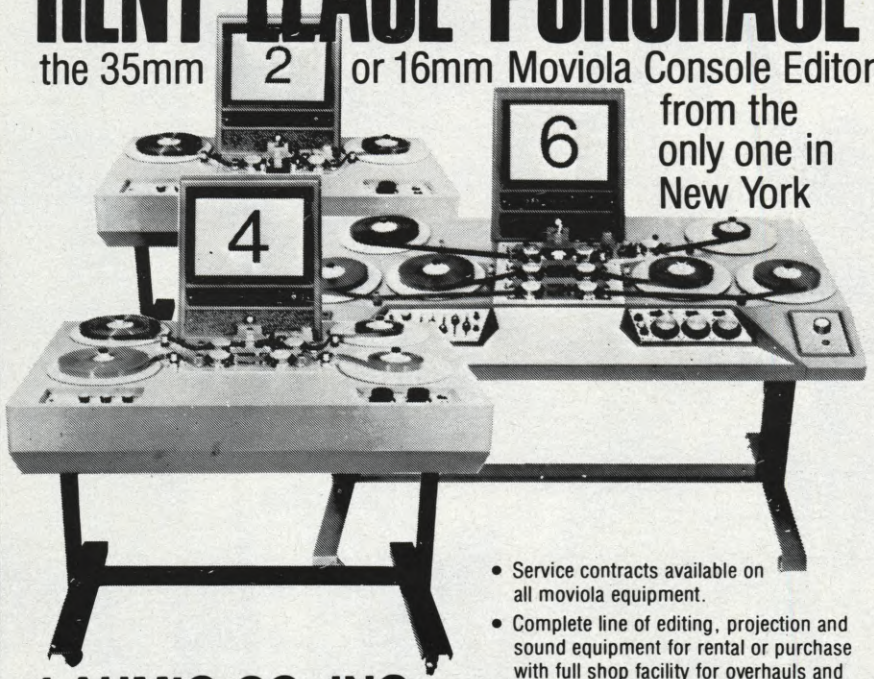

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driving effect.

We had planned 22 exterior shots that night, so time was a critical factor. Street lights were our motivation for the direction of our key light source and 2ks rigged on the store fronts supplied backlight for the action, also highlighting the rain. Spraying the garden hose in front of the lens gave us the depth we needed. The fire hose spray covered sufficient background. Setting the lights and dolly tracks ran smoothly because the crew was able to anticipate shots from our storyboards.

Our exterior lighting was low but the latitude of the negative stock gave us an exposure on buildings and backgrounds we didn't light. The street light *ambiance* read so well that we were pleasantly surprised by signs and other unexpected subtle details. The largest "set" of our film, the street required very little power. We used only 175-200 amps.

Exterior sound recording was nearly impossible with the noise of the generator and the fog nozzle spraying water. For interior recording however, soundman Garrett Collenberger used a LED Vu Meter which was especially helpful, as Garrett explains, for two reasons. "Putting the Vu Meter at the end of the fishpole allowed me to be aware of the boom's position and watch the meter at the same time. Secondly, the light was so low that the Vu Meter enabled me to see it in total darkness. Proper perspective in sound is so important in a dramatic show and so I used a boom to guarantee that perspective. A scene should sound like it looks but the front room was too live. I used 15 package pads on the floors and covered the walls with sound absorbing panels. In the back room camera noise was apparent—in the C.U.'s especially—so we used a barney and pulled the lens shade to improve the sound."

Continuity and makeup presented some unique problems while filming "MUSIC BOX", as we shot out of sequence. Certain scenes required Ginger to appear wet from the rain. Stages of her drying off had to be in sequence and her makeup demanded strong changes because of dramatic attitude and color differences.

Makeup artist Stephanie Downer expressed her philosophy concerning "MUSIC BOX" as "changing the look to suit Ginger's change of mind. I had to take the film stock and lighting into account and go for that look . . . initially very cold and soaking wet, warming so slightly, then trauma and anguish and finally relief after Ginger's shock treatment scenes . . . a drastic change in physical and mental conditions throughout."

An especially unique contribution to the film was Doug Smith's expertise as

cameraman, editor and music composer. Doug explained, "In terms of shooting, it was refreshing to work with a director who knew exactly what he wanted. Ed and I discussed the feeling and types of shots for the film, the angles, dollies and various options, and we stuck with the original game plan. The script made it to the screen.

"Scoring the film was a most rewarding experience for me. Ed and I sat down and discussed the music. He wanted to relate a feeling to me. Ed described the feeling you get at a party, not wanting to be there and you leave the party to walk home. That feeling of walking home is what he was after. I understood, and the actual theme came together.

"Ed wanted the sound of a music box and when I completed the score we checked the possibility of making one, but found the cost prohibitive. I suggested using a kalimba. In the sound mix we recorded the kalimba at 15 IPS and played it back at 30 IPS. We achieved the quality we were after, thanks to Viking Studios, the largest 24-track stereo mobile recording unit in the world."

Re-recording mixer, Paul Emrich at Western Cine in Denver, did an excellent job mixing our sound. Having spent about 15 hours with us, he was proud to say that "MUSIC BOX" was one of his finest mixes.

Reflecting back on the production of "MUSIC BOX", a few memories reassure me of both the challenges and rewards of making films. Shooting 21 dramatic scenes in a day (or night), was exhausting. An unforeseen problem on the first day of filming burdened Ed and me with unexpected pressure. The Costume Shop owner ordered us to leave upon seeing our equipment and crew spread throughout her shop. Some fast diplomacy convinced her of our financial and artistic loss if we had to comply. She relented and even agreed to a second day of filming, but we needed a third, Champagne, a weekend in the mountains and our curious dedication granted us one last 14-hour night to complete our interiors.

We filmed our exteriors the following night in freezing temperatures. Drenching Ginger in the "rain" nearly gave her pneumonia. Our driving shots necessitated a constant speed through downtown Denver, running red lights, maintaining a consistent spray of water on the car from the rear of a pick-up . . . quite a sight!

The sun interrupted our long night of shooting, and we packed our gear in tired silence. The production was over. Everyone gathered in the motor home, exchanging promises to keep in touch. We were all proud to have been part of a fine film. ■

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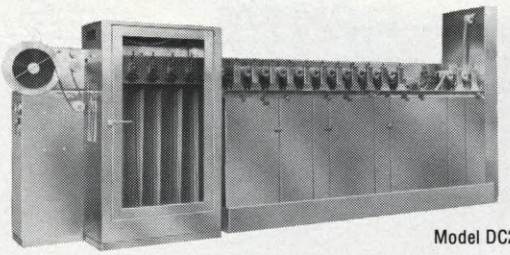

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ORDEAL BY FIRE AND ICE
Continued from Page 1007

on Vietnam and we put together an enormous research library of film for ourselves. We required everyone to look at this material so that all of the details would be accurate—the art directors, the stuntmen, the wardrobe people, the props people, the special effects people. We insisted that everything be authentic—the look of Saigon, the refugees on the road, the kinds of signs in the hospitals and wards, the look of the explosions, the villages. We took a lot of pains to make sure that everybody on the crew was indoctrinated with our research footage, so that the people who had never been in Vietman—which was almost everyone—felt as though they *had* been by the time they'd sat through this material two or three times. Again, it was a way of involving people with the smallest details, of creating a concern for accuracy. We just kept pushing for quality: "Is this the best way? Is there any way we can make it better? If there is, do it." That was our strength, in a sense. We stuck together on it and believed in that method of work and we hope it paid off.

When we needed a hut for the prison camp sequence, we went to a Vietnamese settlement in Thailand, bought a hut, completely disassembled it and shipped it to our River Kwai location, where it was reassembled—all in the interest of absolute authenticity. Because of the tremendous variation in the river level, which could fluctuate 30 feet within 48 hours, the entire hut was built on a submerged platform, a huge thing that allowed the hut to rise and fall with the river level. The Kwai is a very deceptive river—very much like the Snake in Idaho. It's not too wide and it looks calm on the surface, but it moves very rapidly. This gave us an added problem with the "floating" log. The log was solid teak and teak doesn't float, which meant that it had to be completely platformed underneath. In order to pull such a weight against the current, it took two steamboats, with the log attached to steel cables. When we finally got ready to shoot the scene, the cables snapped and the log took off down the river. We chased it in the camera boats. We just managed to get the actors onto the log and begin shooting as the log was free-falling down the River Kwai.

We also had problems in Bangkok, where there is a military curfew seven

days a week and no one is allowed on the streets from 1 AM to 6 AM. This caused us great difficulties when we had to shoot scenes of crowded streets at night. Also, during all the time that we were in Thailand, there were tremendous struggles going on at the Cambodian border. We never knew from day to day what military equipment we would get or not get. For example, on the day that we staged the refugee migration, we had upwards of 2,500 people on the road and hundreds of vehicles. We were taken to the location in the middle of the night and the authorities said, "This is where you have to shoot."

We began organizing the sequence and setting it up and then we were told that we would be able to have the helicopters for only 10 minutes before they would have to fly to the border. By the time we got set up, the choppers had already left the place they started from and were on their way. They made two passes for the cameras and then they were gone.

When we filmed the siege of the American Embassy, we had to shoot the entire sequence before lunch in one day. We never knew from one minute to the next what would happen. To top it off, the first two weeks of footage we shot in Thailand got lost for about a week in the Tokyo airport—and that included the refugee migration sequence, the siege of the Embassy and the Saigon street scenes with upwards of 5,000 extras. We had censors with us every moment, taking pictures of every single thing we did. During some of the filming we were very close to the border between Thailand and Burma. The river was lined with bandits (there had been all kinds of problems with drugs in the area), so we had to have bodyguards around the clock.

In the middle of the Thailand filming there was a military coup and the government changed, which did not make life any easier. But even before we began shooting, the decision had been made by EMI (because of the fluctuating political situation) not to send any film back into the country in the form of dailies. That meant that Vilmos and I were faced with the prospect of shooting for over three months on the most difficult sequences of the picture without ever seeing a foot of film—which is exactly what we did. To offset the risk, we made the decision to use as many cameras as we possibly could on every single set-up, because we simply could not take the chance—especially considering the complexity of the special effects involved. So we shot without ever seeing anything while we were there and, as a result, when we got back to the States, it took me three months just to look at the

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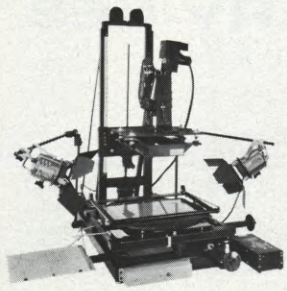

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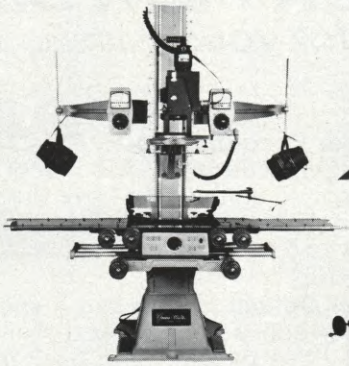

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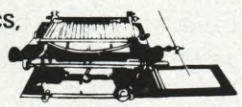

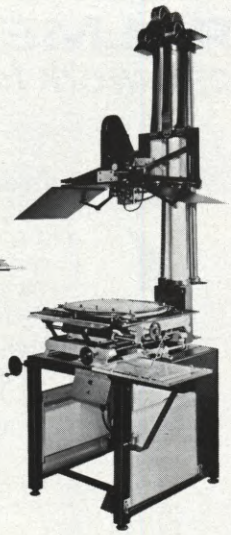

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dailies that we had from Thailand.

The conditions were extremely turbulent over there, which put us under enormous strain. The authorities became increasingly sensitive, perhaps because of what they knew to be a rapidly deteriorating political situation with the then current government. At the time, most of the Southeast Asian countries were trying to normalize relationships with Hanoi in one way or another and, in fact, we lost several locations because the countries involved had just made deals with the Hanoi regime and didn't want anything to do with a film dealing with Vietnam in any way. As a matter of fact, I don't think another major film about Vietnam will be made in Southeast Asia for a very long time. I don't know where you'd go to do it or what kind of cooperation you could count on. You're forced to get all of your military equipment from those governments because you can't get it from the United States government anymore, as filmmakers once could. Of course, "THE DEER HUNTER" may change that, because it isn't a political film.

I've been asked about the authenticity of the sequences depicting a Vietnamese version of Russian roulette and I can only say that I have no way of knowing how prevalent it was. There have been numerous reports in various Southeast Asian newspapers of exactly this sort of thing going on, and in the case of Vietnam, just about anything you can imagine taking place *did* take place in some form or other. As a matter of fact, the man who plays the role of Julien in the picture told me that he lost a friend playing a game exactly like that. Incidentally, that man who played Julien wasn't an actor at all, but a former French fighter pilot who fought at Dien Bien Phu and stayed behind to open a bar in Saigon. Actually, there were no actors in the Saigon sequences, except for the principals. Everyone else was off the street.

The language problems in Thailand were very severe, because not only did those people not speak English, they did not speak Vietnamese either. So we had the dual problem of communicating with the people in the Thai language, while at the same time tutoring them in Vietnamese. We had tutors working with the Thais in the evenings, teaching them the lines in Vietnamese, and when I directed them on the set it was all with hand signals. If you could have photographed that scene, it would have been very, very funny, because it was just a lot of arm waving. It took a great deal of time, because everything had to be done slowly and carefully. I simply had faith that these people would somehow come through—and they did. I'll always remember what Clint Eastwood said to

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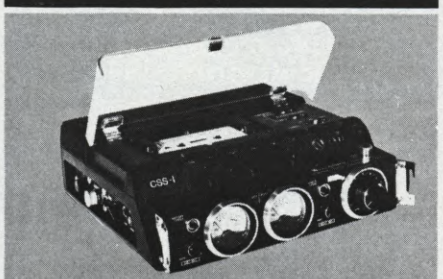

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me when we made "THUNDERBOLT AND LIGHTFOOT" together. He said, "You've got to *will* it through." And that's what we did.

In working with so-called "real" people (as opposed to professional actors), my approach is to deal with them as if they've been doing all their lives what they're called upon to do. I simply don't make anything of it. For example, the fellow who plays the role of Axel, the big bearded guy, is not an actor; he's a steelworker from Gary, Indiana—a foreman in BOX (Basic Oxygen) for U.S. Steel. Bobby De Niro and I flew to Chicago twice to meet and talk with him and we both thought that he would be great in the role. We asked him to do the movie and he said that if we were crazy enough to ask him, he was crazy enough to do it. He showed up on the location and we wardrobed him. I didn't give him the script, but he went to dancing lessons with the rest of the cast. He didn't know what was happening and finally he asked to read the script to find out what he was supposed to do. He got the script before the first day's shooting and all I can say is that, judging from his performance, you'd never know he wasn't an actor.

That was the basic approach. We treated everyone as if they were professionals and they responded. We did the same in Thailand with the people playing Viet Cong; none of them were actors, but to hold your own on the screen alongside Bob De Niro, John Savage and Christopher Walken you've got to do pretty good work, and they all came up to it. I believe it's a great example of people not realizing the potential they have to do certain things. If you don't inhibit them with the mystique of moviemaking or an aura of specialness (in the worst, not the best sense), they'll usually come through. You expect them to be not just good, but extraordinary—and, by God, they do it. It's an act of faith. If you asked me to sum up the entire experience of the film, I would say that the whole enterprise was an act of faith.

Working with Vilmos Zsigmond on "THE DEER HUNTER" turned out to be an extremely happy, creative experience. After I met him and we talked about the project, we went out to the locations and discussed the look and feel of the picture. A lot of his questions were not the questions you would normally expect from a cinematographer; they had to do with the meaning of things and feelings about them. He was always noting his script, in the same way that a good actor fills his script with notes. He was always probing for what I felt, what I was aiming at, what I was trying to say. He was asking questions that an actor would ask—which was very interesting, coming from a cinema-

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tographer, and not the normal situation. I was really intrigued by that.

I explained to Vilmos at the beginning my feelings about location, my feelings about the importance of size and presence of landscape in a film—and the statement that landscape makes, without anyone realizing it. I explained my sense of figures in a landscape and the fact that I didn't need to cover everything conventionally. I told him that because this was a story about a group of men, I wanted to keep them visually in a group before the audience. I wanted to keep them all together on the screen, always in the same shot at the same time, and that, as a result, we would shoot an entire sequence in one shot, without the "coverage" provided by cutaways. This was done purposely, knowing that if we did shoot coverage we'd use it somewhere down the line. This meant that a piece of action in which they walked out of a parking lot might take a full day to set up and rehearse, but would be filmed all in one shot.

I imposed difficult problems like this on Vilmos, not to mention the challenge of shooting summer-for-winter. But on the very first day of shooting, when we laid out the first shot, I looked through the camera and, without saying much to each other, I think we both somehow knew that we were on the same wavelength. I've only had that feeling a couple of times before—the feeling that you are both seeing with the same eye—and to me that's very important. My background is in design and the visual arts and I am very conscious of all that, but I knew almost immediately that there would never be a question between us on that score—and there never was. We were almost always in complete agreement on what something should look like. There was a certain chemistry between us—to use that often overused term. I hadn't anticipated that degree of closeness and it was very necessary to me because it allowed me to relax and concentrate a lot of my energy on the performances. To work with so many nonprofessionals, to group people in one shot with no cutaways, to get everybody at the same level at the same time in a scene—all of that required a great effort, but I was always confident of the look of the picture. I never had to worry about the normal questions of tone, mood or emphasis in framing. There was never a major difference in approach. All of that had been worked out beforehand and we were always in agreement on it. From that standpoint, it was a very happy experience, though difficult, and I believe the results speak for that collaboration. I tried to extend that spirit of collaboration to the rest of the crew, remaining open to ideas and

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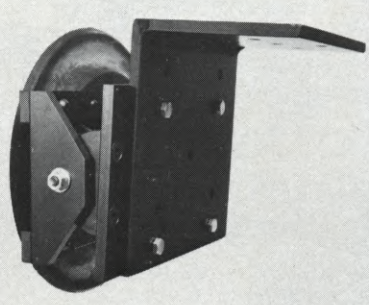

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suggestions.

The cast and crew of "THE DEER HUNTER" were subjected to incredibly brutal conditions, in terms of weather and geography. For the steel town sequences they worked for months in temperatures ranging from 110 to 120 degrees. It was a record-breaking heatwave and it never let up. Then they went from this terrifying heat into the hell of the steel mill blast furnaces, where people were passing out on us.

From there they went directly to the slopes of Mount Baker in Washington where, at heights of 8,000 to 9,000 feet, they shivered in freezing clouds for two weeks when the weather turned sour. Next, without a break, they went from that intense cold straight to Bangkok in the middle of the monsoon season, the middle of summer.

From there we went to the River Kwai and built our bridge about two hours' journey north of the real bridge—in a place which, as it turned out, had more varieties of poisonous snakes than any area in the world. We had a doctor who carried 27 varieties of snake venom with him. The river was full of snakes and they used to come into our rooms at night. In such a remote area every problem is aggravated; every cut or infection festers in an atmosphere like that.

The water of the River Kwai was freezing cold, while the air was burning hot. The sand was so hot you couldn't step on it. It was torturous for the crew, standing in that frigid water during filming of the entire prison camp sequence. They were in the water 12 hours a day and it got to the point where people couldn't walk because they were so numb from the freezing water that came from the mountains. The actors' arms were turning blue. Finally, we had to wear wet suits.

Vilmos has tremendous physical stamina. I can recall days on end when there was no crew, because everyone was sick, and there would be Vilmos behind one camera, me behind another camera and the gaffer, Rick Martens, behind a third camera—shooting the scenes with a complete Thai crew, none of whom spoke a word of English. At one point, my secretary had to keep script notes for a week and a half.

There were a lot of cases of malaria and among the many people who were hospitalized, several had operations while we were there. Some people snapped psychologically. Their systems finally cracked up. They just couldn't take it anymore and an awful lot of them had to go home. But Vilmos hung in there; he didn't miss a day.

Everyone I knew of, when they got back, practically collapsed. I slept for two weeks. I would fall asleep in the middle of

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a conversation, in the middle of dinner. The same was true of the others. This production, right from the start, took a terrible physical toll of everyone who worked on it, even the Thai helicopter pilots who were combat veterans of the Vietnam war.

Speaking of the helicopter sequences on the river, it's very dangerous to fly a chopper low over the water, as required in the script. We had built our bridge on hydraulic supports so that it could be lifted, lowered or canted one way or another. One day, while we were shooting the sequence in which Bob De Niro and John Savage are seen hanging from the runners of the helicopter (which they actually did), one of the runners hooked onto a cable and started to take the whole bridge with it. Vilmos was in a chopper with one camera and Fred Schuler, the operator, was in another chopper shooting. When the whole bridge started to turn upside down, Bob and John slid off and were hanging by cables. The people on the ground were going crazy, but I kept on screaming to Vilmos and Fred to keep shooting, and it's all in the picture.

Finally one of the stuntmen crawled out and unhooked the damned thing. Bobby and John dropped into the river and a chase boat went after them. When we got back we saw that the tail rotor of the helicopter was all bent out of shape. The pilot said that his hands had grown so numb that he couldn't feel the controls anymore. Those pilots weren't used to flying that many hours a day, even in combat. The hardships affected everyone.

I was a medic with a Green Beret unit that trained in Texas and I was called up to go to Vietnam, but, for a number of reasons, wound up not going. However, it was largely my experience with the Special Forces troops while I was taking this training that influenced the spirit of "THE DEER HUNTER" and my feeling toward the men portrayed in it.

Vietnam was, after all, the war of my generation, and so I feel extremely privileged to have had a chance to make a major film about something so important. Not to have had that opportunity would have been like a filmmaker during World War II never having had the chance to deal with it. I would have felt as though I had missed out on something. I was very pleased, also, to have been given the opportunity to work with talents like Robert De Niro, John Savage, Chris Walken, John Cazale and Meryl Streep—and to make a picture about an event that changed this country for all time. I feel very pleased to have been able to do that—and, in some way, *proud* that we did it. ■

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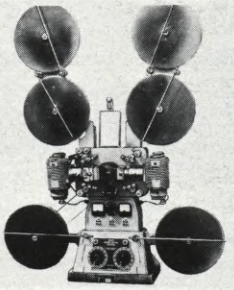

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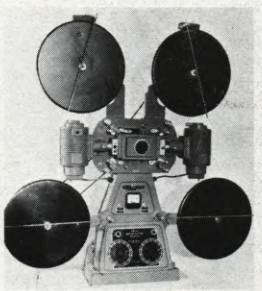

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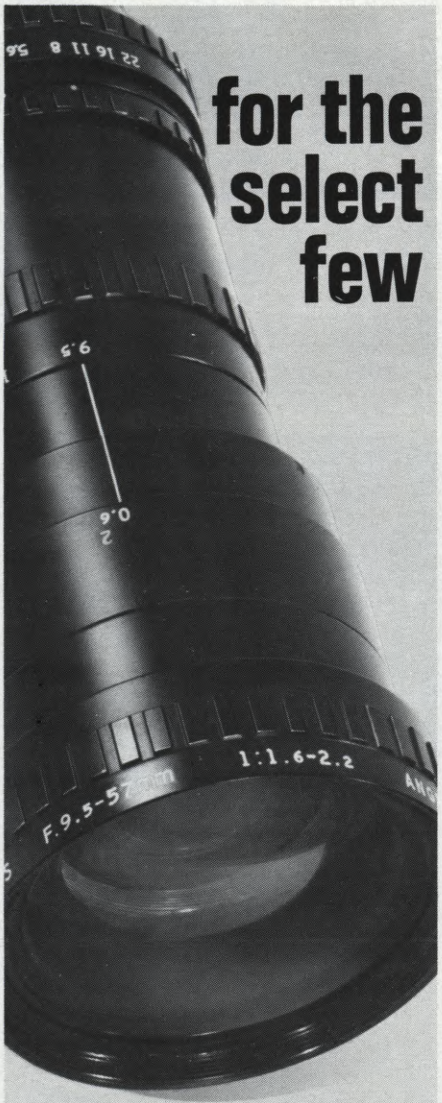

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One point worth considering in regard to image contrast of projected pictures is the amount of stray light in the auditorium. Leaky curtains can impair the contrast of the image projected for a daytime show. We have played a few engagements where the detail of darkening the hall for a daytime show did not occur to anyone, and shafts of sunlight just about wiped out the picture. Overbright exit lights can illuminate the screen with enough intensity to reduce the contrast of the picture appreciably. Check the auditorium with the projector turned off. Can you see the screen by the stray light in the house? Track down and attenuate or shut off the sources.

The projector itself leaks a fair amount of light, much of it upward, creating an unwanted light on the ceiling. This is one reason for a projection booth. Another reason is to muffle the mechanical noise of the machine, thus improving our illusion by eliminating a source of distraction.

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In general, a 1200-watt incandescent lamp used with an f/1.6 projection lens will throw a reasonable picture to 10 feet wide on a matte white screen, or 12½ feet wide on a 1.6-gain screen, or 17 feet wide on a 3-gain beaded screen in a very narrow auditorium. A faster projection lens will improve these figures further. I have been importing a special high acutance f/1.3 lens from Germany which transmits 50% more light than the standard f/1.6 projection lens. With a 1200-watt pro-

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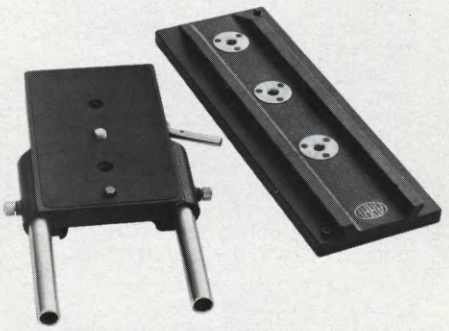

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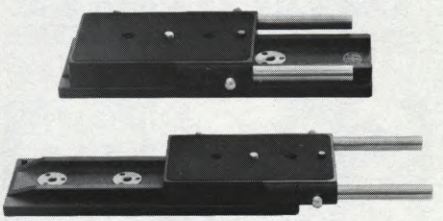

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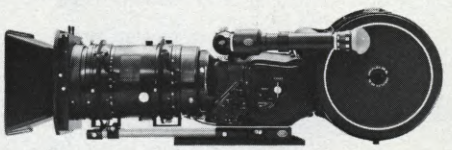

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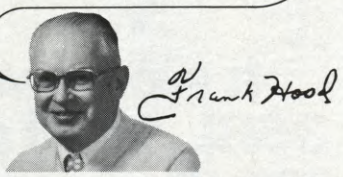

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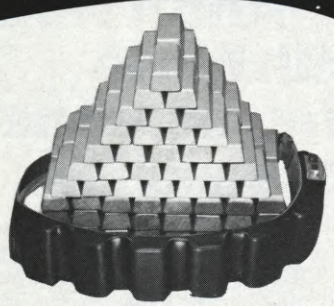

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jector the adequately lit picture on matte white screen would be 12¼ feet, on a 1.6-gain screen 14 feet, and on a 3-gain beaded screen 20 feet, using this 1.3 lens. (Don't rush out and buy a big beaded screen unless all your audience can be seated in a triangle ten degrees either side of the center aisle, as seen from the stage.)

The Marc 300 and Marc 350 light sources have been a major breakthrough in illumination technology. With these lamps, pictures up to 20 feet wide with standard lenses or 25 feet wide with my special f/1.3 lenses are practical, with adequate light.

11. The quality of the projection lens: In many projector designs, the lens is an item purchased from a lens manufacturer, usually with price rather than optical quality as the primary criterion. Lenses for a very popular projector land from Japan at a price under $20 to the projector manufacturer. With the cheapest lens for an Arriflex camera now in the over-$500 category, it is obvious where a weak link exists in the chain.

When I became aware of the forthcoming manufacture by Eastman of the 7252 Commercial Ektachrome, I visited several projection lens makers both in the U.S. and Europe to encourage the manufacture of lenses of truly professional quality, with price commensurate with this requirement. Three of these firms responded—one in England, one in Germany, and a French specialist in variable focal length objectives. They have asked me to represent them in this professional 16mm projection lens sales field. At my request, each of these makers selects the top few lenses from a production run and sends them to me at Essex, New York, where I test each lens personally by autocollimation and closeup examination of the projected image of the same high resolution test pattern used by my English supplier. The characteristics of each lens are recorded. Our identification and serial number are installed, and the lens is matched to the customer's specific requirements. For example, the Eastman models 25 and 45 arc projectors have a curved film channel. It is possible to match this curvature with a lens specifically selected, measured and adjusted to have a like curvature of field. The film lies cylindrically in the Eastman gate and the lens field necessarily has a spherical curvature. While the zone of perfect focus is actually an ellipse in the image area, the rest of the image is so much closer to being in focus that the results are conspicuously improved over the 20-year-old lenses they replace.

Unfortunately, these new lenses will

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not fit the older projectors with the one-inch-diameter lens barrels. This narrow tube design was described by noted lens designer Arthur Warmisham as "a shrink fit for the worst optics you could put in a projector". Actually, most of the 16mm projector lenses up until a few years ago were adaptations of a lens designed by a Hungarian portrait photographer in 1847 to speed up the Daguerrotype process. This Petzval lens formula permitted good definition right on the axis of the image, but the corners were something else. In portrait photography, the eyes, nose and mouth are what count, and they can be kept near the middle of a tintype. But 16mm film technology has proceeded beyond the kind of lens that will resolve only 25 lines per millimeter in the corners. We now need and can get projection lenses with 150-line resolution. Obviously they cost more, but a good lens is a long-term investment, and a vital link in the delivery chain. More than any other single item, the lens that came with the projector in the auditorium has impaired the quality of shows I have done, so today I carry my own set of lenses to use in auditoria where they have not yet seen the light.

Zoom lens attachments are sometimes necessary to fit a picture to a screen when other adjustments, like changing screen size, or projector-to-screen distance, would be difficult or impossible. These attachments almost invariably impair the projected image, by upsetting the correction of the prime lens, adding more glass and reflecting surfaces to scatter light, and by cutting down the illumination throughput of the system by as much as 50%.

(The variable focal length projection lens I import from France has exceptional resolution and contrast, but is not as transparent as the fixed-focal-length lenses from England and Germany. If you now have nearly adequate light with an f/1.6 projection lens and zoom converter, this French f/1.6 variable-focal-length lens will show a marked improvement in sharpness and contrast over your present system.)

12. The focus of the projected image on the screen: This is another possible problem, since the projectionist is usually the most distant person from the screen in the entire theater. With a 2" lens in the projector, the projectionist is five times the width of the screen away from the image. He is 50 feet from a 10-foot picture, and 125 feet from a 25-foot picture. The best that he can see at that distance is 250 to 300 information bits on a surface as wide as the screen appears to him; and we now have 1200 bits to deliver. This means that, despite his best inten-

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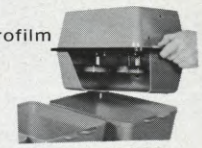

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tions, the projectionist literally cannot keep the picture in focus by eye alone. It is not his fault. It is just that the good Lord did not provide him with retinal cones spaced closely enough to do the job from that distance. (No criticism intended, Sir.) The projectionist, in order to keep the picture sharp, must have aid. There are two solutions. One is a pair of 5- or 6-power binoculars in the projection booth, properly prefocussed on the edge of the screen well before show time, and then mounted on a stand so that they won't jiggle while in use for critical focusing. Breathing and heartbeat cause enough vibration of binoculars to wipe out most or all of the optical gain they would provide in such use, when handheld.

Some projectionists feel that once they have established focus on a sharp title or leader, that's it for the rest of the show. Unfortunately, this ain't so. For one thing, the projector changes shape as it warms up. Using our very good measuring equipment in our instrument shop, we found that a Bell and Howell Model 560 series projector expands .007", measured from the film channel to the lens focus reference, in 15 minutes from a cold start. This is more than the total thickness of the film, so it is necessary to make several adjustments during the first few minutes. Meanwhile, the lens is also warming up and changing shape. Since the optical sum of a projection lens is a magnifying glass, there is more glass in the middle of the lens, and less at the edges. So when the lens is heated by the projector lamp it tends to expand more in the middle than at the edges, also tending to shorten its focal length. (Although I have proposed the notion of lenses temperature-compensated either by optical design or bimetallic mounts, they have not appeared at this writing, so don't put off getting a good lens in hope of soon being able to get one you can set and forget.) Then there is the problem of what happens during a dark film sequence—a series of night shots, for instance. While these are being projected, a good part of the lamp's radiation is being absorbed by the film, so it doesn't all get to the lens; the lens, therefore, begins to cool down, and change shape in the direction of the slightly longer focal length it was when cold. Then perhaps we have some snow scenes—bright, transparent film frames. The lens warms up. The focus shifts.

A conscientious projectionist is a busier man than he used to be if he wants to get everything that's on the film delivered to the screen. Since generally he sees the film only once or twice he has to watch for predictable focus changes and

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compensate by refocussing after they have appeared on the screen.

In view of this, and in view of the fact that some projectionists scorn the 16mm format and its more exacting focus requirements, I have had to come up with an alternate solution. The speaker who made the film is usually right there beside the screen, on the stage. He is the closest man in the house to the picture. Since he knows the visual criteria for his film and knows where focus shifts are likely to occur, it seems logical to conclude that the speaker is the best qualified person to focus the film, by virtue both of proximity and familiarity.

But the speaker is a busy man, keeping his narration, music and effects in pace with the film, trying to maintain the attention of the audience, and hoping that none of the many components of his presentation will come unglued.

Yet, if the focus runs painfully out and the projectionist cannot see it happening, the speaker has to do something to protect his reputation as a maker of good, clear pictures. It has always seemed abysmal showmanship to me to hear the speaker say over the P.A. system "Could the projectionist please sharpen the picture?" Maybe he can and maybe he can't. If you think him capable, a secret word easily inserted in the narration is better than the P.A. party line with a thousand listeners. I use the key word "fabulous" as my communication device. It is a word so cheapened and worn by overuse that I never use it in conversation or narration unless I need to have the focus adjusted.

It requires minimum ingenuity to fit this shopworn word inconspicuously into the narration. If the projectionist remembers my parting words as I leave the booth before the show, "Remember, Fabulous means Focus", we may get results.

Another approach has been under development for the last two lecture seasons and is about to result in a commercial product. This is the do-it-yourself focus, or remote control. Using components originally designed for radio-controlled model aircraft, I have built a system in which a small geared quadrant is attached to the focussing knob of the projector, and a servo is clamped on to the lens mount. The short wire antenna of the servo receiver is draped out the projection port or taped to the projection room viewing port. The servo transmitter, operating on a citizen's band radio frequency, has a knob similar to the projector focus knob, but geared down so as to be capable of finer adjustments.

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using the same frequency as my transmitter (this happened once in 240 shows. The kid wrecked my focus and I wrecked his model airplane.), I can touch up the focus myself. With this system, I see the picture on the screen the way I intended it to look, because the focus is on the button rather than ever-so-slightly sour, or worse.

But this device, being made by human beings, is as perfect as the human beings who make and use it. This means that we cannot eliminate the need for the presence of a capable projectionist. I tell him "If the picture isn't sharp tonight, it's my fault, not yours. But please stay close to the machine and if you hear the word "Fabulous", turn this screw here half a turn to disconnect the whole rig, and focus the best you can in the usual manner."

13. The eye of the audience: This is the final element in the delivery system to achieve our Satisfactory Visual Experience. Many of the members of lecture film audiences have celebrated their 39th birthdays some time back. With advancing age comes reduced visual and aural acuity—so maybe you don't have to be quite so sharp when you play the Golden Age circuit. But you will have to speak more distinctly.

Some of the complaints about pictures "not being clear" come from members of this group with impaired faculties, unable either to see or hear as well as they once did. Occasionally an oldster will say "Speak up, young man", and then peer through thick trifocals to fiddle with his hearing aid. Yet these members of our audience are among our most faithful clientele and deserve any touches we can provide to tailor our product, our colored shadows, to their pleasure. For example: it is known that the aqueous humor in the eye tends to yellow with age, so older people tend to be blue-starved. A print that might seem too cool in color for a younger audience could be more satisfying for an older group.

Vision varies widely, so the figures I have given for resolution and screen brightness are for viewing by people with good to excellent vision. If we can satisfy these clients, we should be able to please most of the rest, who cannot see as well, but who still will appreciate the effort, the thought, the care, the dedication of all those involved in the delivery of the Satisfactory Visual Experience. ■

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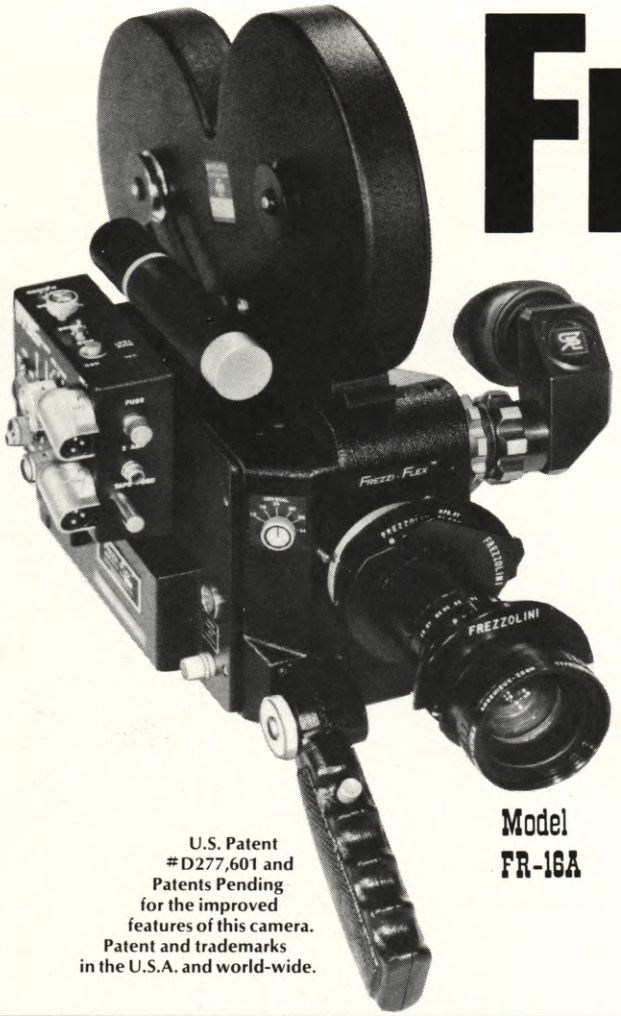

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